**BARTON COMMUNITY COLLEGE**

##### COURSE SYLLABUS

## GENERAL COURSE INFORMATION

Course Number: LIFE 1402

Course Title: Principles of Biology

Credit Hours: 5 Credit Hours

Prerequisites: None

Division/Discipline: Academic Division/Life Science

Course Description: The course introduces the student to the unifying principles common to all levels of biological organization. Emphasis is at the cellular, organismic and population levels with inquiry into the nature of scientific investigation. This course is designed to provide students with a biological frame of reference in a liberal education as well as for students selecting additional courses in the department of biology.

1. **INSTRUCTOR INFORMATION**

## COLLEGE POLICIES

Students and faculty of Barton Community College constitute a special community engaged in the process of education. The College assumes that its students and faculty will demonstrate a code of personal honor that is based upon courtesy, integrity, common sense, and respect for others both within and outside the classroom.

Plagiarism on any academic endeavors at Barton Community College will not be tolerated. The student is responsible for learning the rules of, and avoiding instances of, intentional or unintentional plagiarism. Information about academic integrity is located in the Student Handbook.

The College reserves the right to suspend a student for conduct that is detrimental to the College's educational endeavors as outlined in the College catalog, Student Handbook, and College Policy & Procedure Manual. (Most up-to-date documents are available on the College webpage.)

Anyone seeking an accommodation under provisions of the Americans with Disabilities Act should notify Student Support Services via email at [disabilityservices@bartonccc.edu](mailto:disabilityservices@bartonccc.edu).

## COURSE AS VIEWED IN THE TOTAL CURRICULUM

Principles of Biology is an approved general education course at BCC, which can be used to fulfill degree requirements as a breadth laboratory science course in the natural/physical science. In addition, it is required (or recommended) to be taken by students enrolled in life science programs and certain allied health programs at the College, and certain pre-professional programs (e.g., Pre-dentistry, Pre-forestry, Pre-medical technology, Pre-medicine, Pre-pharmacy, Pre-wildlife Science).

The learning outcomes and competencies detailed in this course syllabus meet or exceed those specified for this course by the Kansas Core Outcomes Groups project, and as approved by the Kansas Board of Regents –[http://kansasregents.org/transfer\_articulation](https://mail.bartonccc.edu/owa/redir.aspx?C=qVD-LBvN0kGqrR1qYRD1DhVzTst039IIQPv6y5zBJIs2AFzqxzQ44MHNcN2AIt8qr6rQMioa1FI.&URL=http%3a%2f%2fkansasregents.org%2ftransfer_articulation).

This course transfers well and may be used to help fulfill credit and course requirements for general education at all Kansas Regents institutions. However, general education requirements vary among institutions, and perhaps even among departments, colleges, and programs within an institution. Also, these requirements may change from time to time and without notification. **Therefore it shall be the student’s responsibility to obtain relevant information from intended transfer institution during his/her tenure at BCC to insure that he/she enrolls in the most appropriate set of courses for the transfer program.**

## ASSESSMENT OF STUDENT LEARNING

Barton Community College is committed to the assessment of student learning and to quality education. Assessment activities provide a means to develop an understanding of how students learn, what they know, and what they can do with their knowledge. Results from these various activities guide Barton, as a learning college, in finding ways to improve student learning.

Course Outcomes, Competencies, and Supplemental Competencies:

* 1. Demonstrate the nature of science through the study and use of the scientific method.
     1. List and describe the process of the scientific method.
     2. Construct testable hypotheses and formulate replicable experiments.
     3. Perform experiments that utilize accurate data collection and analyses of results.
     4. Identify the control, independent, and dependent variables in an experiment, as well as the control group and the experimental group.
  2. Identify the levels of organization; i.e., chemical, cellular, organismal and ecological, and explain properties of life.
     1. List and describe the characteristics of living things, and illustrate with examples how the inherent features in each level are important to the maintenance of life.
     2. Identify the levels of increasing complexity of biological organization.
     3. Explain how chemical structure, chemical properties, and bonding impact the continuity of life.
     4. Compare and contrast the four major groups of biochemical molecules and describe their functions.
     5. Describe the cell theory and how it relates to the overall structure and function of both unicellular and multicellular organisms.
     6. Differentiate between prokaryotic and eukaryotic cells in terms of their structure, and organelle composition and function, and the advantage of specialization in eukaryotic cells.
     7. Explain how the fluid mosaic model of the plasma membrane functions in the regulation of materials entering and exiting the cell, including energy requirements of each type of active and passive transport processes.
  3. Analyze bioenergetics through the study of enzyme activity, metabolism, cellular respiration, and photosynthesis.
     1. Distinguish between an autotroph and a heterotroph in terms of energy acquisition for the organism, and the ecological significance of each type.
     2. Explain the role of the ATP-ADP cycle, and how ATP functions as an energy carrier in metabolic reactions.
     3. Distinguish between catabolic and anabolic metabolisms, and the role energy plays in each.
     4. Describe the mechanism of enzymes as catalysts in biochemical reactions, and the factors that affect enzyme activity.
     5. Describe the overall chemical reaction of cellular respiration, outline the major events taking place in anaerobic respiration (glycolysis followed by alcohol fermentation or lactic acid fermentation) and aerobic respiration (glycolysis, Kreb’s cycle, and electron transport chain), and how the structures in the mitochondria facilitate each process.
     6. Describe the overall chemical reaction for photosynthesis, outline the major events taking place in the light-dependent and light-independent (Calvin cycle) reactions, and the role of structures in the chloroplast to facilitate these reactions.
  4. Outline the importance of reproduction in maintaining the continuity of life through the study of mitosis, meiosis, differentiation/development, and diversity of reproductive strategies.
     1. Compare and contrast cell division in prokaryotic and eukaryotic cells.
     2. Diagram and explain the cell cycle, including the involvement of the structural, functional, and developmental cellular components.
     3. Describe the steps of mitosis in terms of what is happening with the chromosomes during each phase.
     4. Apply the principles of mitosis to what takes place in the development of cancer.
     5. Describe the process of meiosis in sexual reproduction, and the ways that genetic diversity is facilitated at various points in the process.
     6. Compare and contrast the results of mitosis and meiosis.
     7. Compare the major reproductive strategies associated with internal and external fertilization.
     8. Compare and contrast asexual and sexual reproduction, and describe asexual reproduction’s effect on biodiversity.
  5. Apply principles of genetics to unity and diversity of life through the study of classical and molecular genetics.
     1. Differentiate between a monohybrid cross and a dihybrid cross, and illustrate how experimental crosses work by utilizing Punnett squares to determine phenotypic and genotypic ratios.
     2. Explain Mendel’s Law of Segregation and Law of Independent Assortment, and the relationship between the events of meiosis and Mendel’s principles of heredity.
     3. Describe inheritance patterns including dominance, incomplete dominance, codominance, epistasis, pleiotropy, sex-linked traits, nondisjunction disorders, and the effect of environmental influence on genetic traits.
     4. Compare and contrast DNA and RNA in structure and function, and explain how the DNA molecule replicates prior to mitosis or meiosis.
     5. Describe how chromosomes direct the production of proteins according to the Central Dogma of Gene Expression.
     6. Describe the mechanisms that cause mutations, and the possible effects these mutations can have on protein production and future generations.
     7. Describe the basic process of genetic engineering, and its uses in fields such as medicine and agriculture.
  6. Discuss evolutionary theory as a mechanism of change through the study of natural selection, speciation, and diversity of life.
     1. Compare and contrast microevolution and macroevolution, including examples of each.
     2. Explain how evolution helps explain the similarities and differences among organisms.
     3. Summarize Darwin’s theory of natural selection, and the steps in the process.
     4. Describe the steps involved in natural selection.
     5. Explain the concept of speciation through adaptive radiation, and its overall effect on biodiversity.
     6. Compare and contrast the three biological domains, and give examples of organisms in each.
     7. Compare and contrast the current biological kingdoms, and list major characteristics of each in terms of cell type, cellularity, type of reproduction, and mode of nutrition.
  7. Explain principles of ecology through the study of ecosystem organization, ecological interactions, and environmental issues.
     1. Identify the levels of increasing complexity of ecological organization.
     2. Describe the importance of the laws of thermodynamics to energy flow in living cells.
     3. Diagram the flow of energy through an ecosystem, the pathway of energy flow, the energy utilization by living systems, and the loss of energy in an ecosystem.
     4. Describe the interactions between the biotic and abiotic components in an ecosystem.
     5. Describe the ecological interactions that are involved in food chains, food webs, and symbiotic relationships.
     6. Identify various environmental challenges facing humans and other living organisms today, and describe some possible ways to reduce these pressures on the environment.
  8. Demonstrate good laboratory technique, documentation and communication of the results.
     1. Follow written instructions accurately.
     2. Work in a group setting safely and effectively, using scientific equipment carefully and correctly.
     3. Acquire data, make and record visual observations by means of accurate diagrams.
     4. Correlate laboratory observations with knowledge of cellular morphology and metabolism.
     5. Discuss laboratory results obtained in the context of the competencies identified above in outcomes A-G.

1. **INSTRUCTOR'S EXPECTATIONS OF STUDENTS IN CLASS**

1. **TEXTBOOKS AND OTHER REQUIRED MATERIALS**

## REFERENCES

### METHODS OF INSTRUCTION AND EVALUATION

### Since laboratory activities are integral to the learning outcomes of this lab science course, students must pass the laboratory portion of the class in order to successfully complete (“pass”) the course.

### ATTENDANCE REQUIREMENTS

## COURSE OUTLINE