

Course Outline

COURSE: BIO 10 **DIVISION:** 10 **ALSO LISTED AS:**

TERM EFFECTIVE: Summer 2020 **CURRICULUM APPROVAL DATE:** 05/12/2020

SHORT TITLE: PRIN BIOLOGY L/L

LONG TITLE: Principles of Biology

<u>Units</u>	<u>Number of Weeks</u>	<u>Type</u>	<u>Contact Hours/Week</u>	<u>Total Contact Hours</u>
4	18	Lecture:	3	54
		Lab:	3	54
		Other:	0	0
		Total:	6	108

COURSE DESCRIPTION:

An introductory biology course covering functions at the cellular and organismal levels. Includes study of the basic principles of metabolism, heredity, evolution and ecology. Primarily for non-biological science majors. **ADVISORY:** Eligible for English 280 and Mathematics 430 or skills equivalent to those in an Elementary Algebra course.

PREREQUISITES:

COREQUISITES:

CREDIT STATUS: D - Credit - Degree Applicable

GRADING MODES

L - Standard Letter Grade

REPEATABILITY: N - Course may not be repeated

SCHEDULE TYPES:

- 02 - Lecture and/or discussion
- 03 - Lecture/Laboratory
- 04 - Laboratory/Studio/Activity
- 04B - Laboratory - LEH 0.75
- 05 - Hybrid
- 72 - Dist. Ed Internet Delayed
- 73 - Dist. Ed Internet Delayed LAB
- 73B - Dist. Ed Internet LAB-LEH 0.75

STUDENT LEARNING OUTCOMES:

By the end of this course, a student should:

1. Describe and explain the processes and structures common to all living things.
2. Explain how evolution drives and shapes an ecosystem, and has resulted in both the similarities and differences between all living things.
3. Explain the process of how traits are inherited, and how genes are responsible for those traits.
4. Demonstrate the use of a compound light microscope and other laboratory equipment.

CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS

Curriculum Approval Date: 05/12/2020

3 LEC HOURS

Topic: INTRODUCTION TO BIOLOGY

Objectives:

1. Define biology.
2. Describe the characteristics of living things.
3. Describe the levels of biological organization.
4. Explain the steps of the scientific process.
5. Describe the basic system of taxonomy used in biology.
6. Describe ecological interactions.
7. Effectively organize and present information to a group.

Assignments: read text, answer homework questions.

3 LEC HOURS

Topic: BASIC CHEMISTRY

Objectives:

1. Define and explain the differences between the following: atom, molecule, compound, ion, isotope.
2. Diagram the structure of an atom including the placement of electrons in the appropriate energy levels.
3. Explain and compare the different types of chemical bonding.
4. Explain how the structure of water gives it unique properties.
5. Explain the pH scale.

Assignments: read text, answer homework questions.

3 LEC HOURS

Topic: MACROMOLECULES

Objectives:

1. Explain what macromolecules are and how they are assembled and disassembled.
2. Describe the basic forms and functions of the four classes of biologically important molecules.

Assignments: read text, answer homework questions.

6 LEC HOURS

Topic: CELL STRUCTURE AND FUNCTION

Objectives:

1. Describe and explain the General Cell Theory.
2. Describe surface area to volume ratio and explain its impact on cell size.
3. Describe the differences between prokaryotic and eukaryotic cells.
4. Describe and define the functions of cell organelles and other subcellular structures.
5. Describe the functions of the cell membrane.

6. Describe the structure of the cell membrane and explain how the parts perform the membrane's functions.
7. Explain the processes of diffusion, facilitated diffusion, osmosis, and active transport and explain how these processes affect the movement of materials across a cell membrane.

Assignments: read text, answer homework questions.

3 LEC HOURS

Topic: ENERGY & ENZYMES

Objectives:

1. Define energy and explain its states.
2. State and explain the First and Second Laws of Thermodynamics.
3. Explain how energy can be transferred from an exergonic reaction to an endergonic reaction.
4. Describe the role of ATP in living systems.
5. Explain the function of an electron transport system.
6. Explain the function of enzymes in living systems.
7. Explain how enzymes function.

Assignments: read text, answer homework questions.

3 LEC HOURS

Topic: PHOTOSYNTHESIS

Objectives:

1. Explain the function of photosynthesis.
2. Describe the reactants and products of the light dependent and light independent reactions and compare and contrast the functions of both.
3. Describe the role of pigments in photosynthesis.
4. Describe leaf structure and its importance in photosynthesis.

Assignments: read text, answer homework questions.

3 LEC HOURS

Topic: METABOLISM

Objectives:

1. Explain the function of cellular respiration.
2. Describe the differences between aerobic and anaerobic respiration, both in the processes and in their relative efficiency.
3. Describe the reactants and products of the three major steps of aerobic respiration.
4. Explain the complementarity of photosynthesis and aerobic respiration.

Assignments: read text, answer homework questions.

6 LEC HOURS

Topic: CELL CYCLE

Objectives: 1. Describe the cell cycle and explain how it differs from a life cycle.

2. Compare and contrast sexual and asexual reproduction.
3. Describe the steps of mitotic cell division and explain the function of mitosis.
4. Describe the steps of meiotic cell division and explain the function of meiosis.
5. Describe crossing-over and independent assortment and explain their roles in increasing genetic variability.
6. Describe what abnormalities may occur during cell division and explain the consequences of these abnormalities.

Assignments: read text, answer homework questions.

7 LEC HOURS

Topic: GENETICS

Objectives:

1. Describe the Principle of Segregation and the Principle of Independent Assortment.
2. Explain how these two principles affect the inheritance of specific genes.

3. Explain the difference between a gene and an allele.
4. Define genotype and phenotype.
5. Define complete dominance, incomplete dominance, and codominance.
6. Define pleiotropy and polygenetic inheritance and give examples.
7. Explain sex linkage of genes.
8. Define polyploidy and aneuploidy, describe how they can occur, and give examples of their effects.

Assignments: read text, answer homework questions.

3 LEC HOURS

Topic: GENE EXPRESSION

Objectives:

1. Define a gene.
2. Explain the relationship between a gene and the protein coded for by a gene.
3. Explain the 3 types of RNA and describe their roles in the process of translation.
4. Describe the processes of transcription and translation.
5. Explain how the genetic code works.
6. Explain how genetic mutations occur.
7. Explain the importance of mutations in the evolutionary process.

Assignments: read text, answer homework questions.

3 LEC HOURS

Topic: THEORY OF EVOLUTION

Objectives:

1. Describe the history of evolutionary thought from Aristotle to Darwin and Wallace.
2. Explain Darwin's Theory of Evolution by Natural Selection.
3. Describe the forms of evidence used to demonstrate that evolution has occurred.
4. Describe present-day examples of evolution.

Assignments: read text, answer homework questions.

3 LEC HOURS

Topic: POPULATIONS

Objectives:

1. Define evolution, species, and population.
2. Describe mutation, gene flow, genetic drift, and natural selection and explain how each affects the genetic variability within a single population and between two populations of the same species.
3. Describe the modes of natural selection and give examples of each.
4. Describe sexual selection and explain how it can lead to sexual dimorphism.
5. Define speciation.
6. Explain the different types of genetic isolation and its importance in speciation.

Assignments: read text, answer homework questions.

3 LEC HOURS

Topic: COMMUNITIES

Objectives:

1. Define the term community.
2. Explain the four major types of community interactions: competition; predation; parasitism; and mutualism.
3. Describe the role a keystone species plays in a community.
4. Explain the process of ecological succession and how it changes a community.

Assignments: read text, answer homework questions.

3 LEC HOURS

Topic: ECOLOGY

Objectives:

1. Define ecology.
2. Identify biotic and abiotic components of the environment and explain how they interact.
3. Explain the difference between an ecosystem and a community.
4. Define ecological niche and explain the niche's role in determining what organisms will be found in a community.
5. Describe the roles of competition, predation, and symbiosis in shaping a community.
6. Describe the process of succession and compare and contrast primary and secondary succession.
7. Explain how climate and geography determines the climax community.
8. Explain how energy flows through a community and how this flow results in the pyramid of biomass.
9. Describe the process of biological magnification and explain its importance to populations of top consumers.
10. Define and give examples of biogeochemical cycles.
11. Explain how acid deposition occurs.

Assignments: read text, answer lecture quiz and homework questions.

2 LEC HOURS

FINAL EXAM

Lab Content:

6 LAB HOURS

Lab Topic: LAB RULES & SAFETY, SCIENTIFIC PROCESS

Objectives:

1. List the norms for behavior in the laboratory.
2. Explain why these norms are important.
3. Describe the steps in the scientific process.
4. Explain what characterizes a question that can be answered by the scientific process, and identify these types of questions.
5. Explain what characterizes a good scientific hypothesis, and identify scientific hypotheses.
6. Define and give examples of independent, dependent, and standardized variables.
7. Identify the variables in an experiment.
8. Explain what control treatments are and why they are used.
9. Explain what replication is and why it is important.

Assignments: Complete lab report.

6 LAB HOURS

Lab Topic: USE OF THE MICROSCOPE

Objectives:

1. Identify and describe the parts of a microscope.
2. Safely and properly handle a microscope and microscope slides.
3. Operate a compound light microscope: mount a slide on a microscope stage, adjust the light, and focus on a specimen.
4. Explain the microscopy concepts of field of view, image orientation, and depth of field.
5. Prepare a wet mount slide specimen.
6. Prepare a simple stain slide specimen.

Assignments: complete lab report, demonstrate skills to the instructor.

6 LAB HOURS

Lab topic: CELL STRUCTURE & MEMBRANE TRANSPORT

Objectives:

1. Explain the processes of diffusion and osmosis.
2. Define the terms concentration gradient, selectively permeable, hypertonic, hypotonic, and isotonic.

3. Describe what happens when cells are in hypertonic, hypotonic, and isotonic environments.
4. Describe the processes of plasmolysis, crenation, and hemolysis.
5. Explain the relationship between surface area and volume as objects get larger.
6. Explain how this relationship influences the size and shape of cells.

Assignments: complete lab report.

3 LAB HOURS

Lab Topic: REVIEW

3 LAB HOURS

Lab Topic: ENZYMES

Objectives:

1. Define the terms catalyst and enzyme.
2. Explain the properties of catalysts and enzymes.
3. Explain how and why surface area, high temperature, and pH affect an enzyme's ability to catalyze a reaction.

Assignments: complete lab report.

3 LAB HOURS

Lab Topic: PHOTOSYNTHESIS

Objectives:

1. Describe the overall process of photosynthesis.
2. Describe chloroplast structure in plant cells.
3. Describe the role of pigments (such as chlorophyll) in photosynthesis.
4. Explain how pigments and filters work.

Assignments: complete lab report.

3 LAB HOURS

Lab Topic: METABOLISM

Objectives:

1. Describe the overall process of aerobic glucose metabolism.
2. Describe the overall process of anaerobic glucose metabolism (fermentation).
3. Describe the differences between aerobic and anaerobic metabolism.
4. Explain why some lentils respired while others did not.
5. Explain why some sugars are easier for yeast to ferment than others.

Assignments: complete lab report.

3 LAB HOURS

Lab Topic: MITOSIS & MEIOSIS

Objectives:

1. Identify the phases of mitosis.
2. Describe the major events of mitosis and meiosis.
3. Explain the purpose of mitosis and meiosis.
4. Describe how animal and plant cell mitosis are similar and different.

Assignment: complete lab report.

3 LAB HOURS

Lab Topic: REVIEW

3 LAB HOURS

Lab Topic: GENETICS

Objectives:

1. Define all terms in bold on this page.

2. Explain the inheritance of traits controlled by one gene: when one allele is dominant and the other is recessive; when one allele is dominant and the other is recessive, and the gene is X-linked; when two alleles are codominant to each other.

Assignment: complete lab report.

3 LAB HOURS

Lab Topic: GENE EXPRESSION

Objectives:

1. Describe the structure and function of DNA.
2. Explain the overall process of gene expression.
3. Describe the effect of UV radiation on DNA.

Assignments: complete lab report.

3 LAB HOURS

Lab Topic: REVIEW

3 LAB HOURS

Lab Topic: EVOLUTION & COMPARATIVE ANATOMY

Objectives:

1. Define the terms evolution, variation, and natural selection.
2. Explain how comparative anatomy provides evidence to support evolutionary theory.
3. Describe the differences between homologous and analogous structures.
4. Construct arguments and make claims using evidence from class discussion and a short film.
5. Use data to make predictions about the effects of natural selection.

Assignments: complete lab report.

3 LAB HOURS

Lab Topic: NATURAL SELECTION

1. Use data to make predictions about the effects of natural selection.
2. Produce a bar graph to illustrate predicted results and compare them to actual results.
3. Explain how speciation can occur.
4. Describe the conditions required for a Hardy-Weinberg equilibrium population.
5. Use the Hardy-Weinberg equations to calculate phenotype and genotype frequencies.

Assignments: complete lab report.

3 LAB HOURS

Lab Topic: ECOLOGY

Objectives:

1. List and briefly describe some of the communities found in the duck pond.
2. Define and recognize examples of producers, consumers, herbivores, carnivores, omnivores and decomposers.
3. Describe the difference between trophic levels and food webs.

Assignments: complete lab report.

METHODS OF INSTRUCTION:

Instructional Methods include lecture and lab with use of audio/visual aids, group discussions, and hands-on laboratory exercises.

OUT OF CLASS ASSIGNMENTS:

Required Outside Hours: 78

Assignment Description:

Lecture homework and online equivalent assignments

Required Outside Hours: 30

Assignment Description:

Lab reports or online equivalent

METHODS OF EVALUATION:

Writing assignments

Percent of total grade: 25.00 %

Questions requiring written responses will be used in a combination of online Discussion Boards, Homework, Lab Reports, and Free Response exam questions.

Problem-solving assignments

Percent of total grade: 15.00 %

Questions of this nature will be used in a combination of Homework, Lab Reports, Quizzes, and Exams.

Objective examinations

Percent of total grade: 60.00 %

A combination of Multiple Choice, True/False, Matching, Fill-In, and Free Response questions.

REPRESENTATIVE TEXTBOOKS:

Fowler, et al.. Concepts of Biology. OpenStax,2020.

This textbook is OER and makes this a ZTC course. It is comparable in quality to the book that was previously used.

ISBN: 9781947172036

Reading Level of Text, Grade: 13 Verified by: Publisher

Required Other Texts and Materials

Biology 10 Laboratory Manual

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:

GAV B2, effective 201230

GAV B3, effective 201230

CSU GE:

CSU B2, effective 201230

CSU B3, effective 201230

IGETC:

IGETC 5B, effective 201230

IGETC 5C, effective 201230

CSU TRANSFER:

Transferable CSU, effective 201230

UC TRANSFER:

Transferable UC, effective 201230

SUPPLEMENTAL DATA:

Basic Skills: N

Classification: Y

Noncredit Category: Y

Cooperative Education:

Program Status: 1 Program Applicable

Special Class Status: N

CAN:

CAN Sequence:

CSU Crosswalk Course Department:

CSU Crosswalk Course Number:

Prior to College Level: Y

Non Credit Enhanced Funding: N

Funding Agency Code: Y

In-Service: N

Occupational Course: E

Maximum Hours:

Minimum Hours:

Course Control Number: CCC000310399

Sports/Physical Education Course: N

Taxonomy of Program: 040100