

Prepared by the Department of Natural Science and Applied Technology

Date of Departmental Approval: February 15, 2017

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Effective: Fall 2017

**1. Title: BIO151 General Biology I
BIO151L General Biology I Laboratory****2. Course Description**

This first course in a two-semester sequence in introductory biology for science majors or science-interested students is designed to acquaint the student with foundational principles of biology with an emphasis on cellular structure and function. Topics covered will include the basic chemical properties of living things, cellular metabolism, molecular genetics, gene expression and Mendelian genetics. The laboratory features activities and experiments that reinforce the concepts presented in lecture. (3 class hours/ 3 laboratory hours)

3. Student Learning Outcomes (Instructional Objectives, Intellectual skills)

Upon completion of the course, the student is able to:

- Describe and discuss scientific methodology and the evolution of the scientific method.
- Display proficiency in various laboratory techniques and instrumentation. Design a valid experimental protocol and write a properly formatted formal laboratory report.
- Explain the principals of chemical structure and bonding, and summarize the synthesis and functions of the major classes of organic molecules.
- Describe the cell theory, distinguishing between prokaryotic cells, eukaryotic cells, and viruses. Describe the structure and function of each cellular organelle in eukaryotic cells, including the plasma membrane in both cell types.
- Distinguish heterotrophic from autotrophic organisms. Differentiate between the metabolic mechanisms of anaerobic prokaryotes, aerobic prokaryotes, and eukaryotes. Summarize the metabolic processes occurring during energy transfer in cells, including photosynthesis and cellular respiration.
- Summarize the events of the cell cycle in both plant and animal cells. Explain the importance of mitosis and meiosis and differentiate the events of each.
- Describe the structure and replication of DNA, and explain the processes involved in gene expression and protein production.
- Explain Mendelian genetics and describe the sources of genetic variation in sexually reproducing organisms.
- Provide examples of applications of biotechnology. Discuss, objectively, the ethical issues associated with emerging biotechnology such as cloning, genetic modification, and stem cell research.

4. Credits: 4 credits**5. Satisfies General Education Requirement:** Natural or Physical Science**6. Prerequisite(s):** MAT045 (Intermediate Algebra for STEM) or satisfactory basic skills assessment scores **Co-requisite:** ENL101**7. Semester(s) Offered:** Fall, Spring, Summer**8. Suggested Guidelines for Evaluation:** Three full-period exams, weekly quizzes, two lab practical exams, lab reports**9. General Topical Outline of the Course:****I. Biology as a Science**

Scientific Method

Overview and History

Levels of Organization

Naming of Organisms / Classification

Evolutionary Change / Natural Selection

II. Fundamentals of Chemistry

Atomic Structure

Chemical Bonds

Acids and Bases, pH

Oxidation/Reduction

Chemistry of Water

Carbon and Organic Compounds

Polymer Formation

Carbohydrates / Lipids / Proteins / Nucleic Acids

III. Subcellular Organelles

Organelles / Cytoskeleton

Plant vs. Animal

Prokaryotic vs. Eukaryotic

IV. Cell Membranes

Concentration Gradients

Active vs. Passive Transport

Channels / Pumps

Endo / Exocytosis

Cell Walls / Coats / Cell Connections

V. Energy Transformation (Metabolism)

Introduction

Chemosynthesis

Oxidation/Reduction

ATP

Cellular Respiration

Glycolysis and Fermentation

Krebs Cycle

Mitochondria and Electron Transport

Fat and Protein Metabolism

Photosynthesis

Light and Pigments

Photophosphorylation

Carbon Fixation (Calvin Cycle)

VI. Cellular Division

Mitosis

Cell Cycle / Control

Apoptosis

Cancer

Meiosis

Genetic Diversity through Meiotic Events

Sexual vs. Asexual Reproduction

VII. The Basic Principles of Heredity

Mendelian genetics

Monohybrid, dihybrid and multihybrid crosses.

Dominance, linkage and crossing over

Lethal genes, sex linked inheritance and probability

VIII. Biotechnology

Genome sequencing and manipulation

Stem cell biology

Bioethics