

**NORTHWESTERN CONNECTICUT COMMUNITY COLLEGE
COURSE SYLLABUS**

Course Title: General Biology I with Lab

Course #: BIO 121

4 credits

Course Description: This course serves as an introduction to college biology and as a foundation for other biological science courses. This course serves as an introduction to college biology and as a foundation for other biological science courses. Students will acquire knowledge of the fundamental principles and core concepts of biology: evolution, pathways and transformations of energy and matter; information flow, exchange, and storage; and cell structure and function through active experimentation and active-learning.

Pre-requisite: High School Biology in Junior or Senior year or equivalent, and successful completion of Eng 063 and Eng 073, or ENG 085, or ENG 093, or satisfactory placement test scores. Computer skills, including email, word processing, and web navigation are critical for this course. Goals: The goal of this course is to provide students with an understanding of the fundamental principles of biology including cell structure and function, genetics and evolution.

Concepts: Upon the completion of this course, students should be able to:

A. Describe the chemical composition of living things.

In order to do this, students need to complete the reading assignments and homework, watch the prezis, participate in in-class lectures, discussion and activities and study the material, so that they will be able to:

1. Describe atomic structure and bonding and provide examples of ionic, covalent and hydrogen bonds.
2. Explain the chemical basis of living organisms.
3. Describe the structure of water and properties and significance to life.
4. Define pH in terms of hydrogen ion concentration and be able to identify and given pH as acid, alkaline, or neutral; describe how pH changes are minimized by buffers.
5. Differentiate between the molecular structure of carbohydrates, lipids, proteins and nucleic acids, and provide examples of each and the role they play in the cell.

B. Describe the structure of a cell, the role of the various organelles and explain how substances are transported in and out of cells

In order to do this, students need to complete the reading assignments and homework, watch the prezis, participate in in-class lectures, discussion and activities and study the material, so that they will be able to:

6. Describe the structure and function of the major components of prokaryotic cells and organelles of eukaryotic cells. Explain how prokaryotic and eukaryotic cells differ.
7. Describe the fluid mosaic model of the membrane and the various mechanisms (passive diffusion, osmosis, facilitated diffusion, active transport and membrane assisted transport) that materials use to cross this structure.
8. Describe the complementarity of structure and function of cellular communication pathways and cell adhesions.

C. Explain how cells obtain energy.

In order to do this, students need to complete the reading assignments and homework, watch the prezis, participate in in-class lectures, discussion and activities and study the material, so that they will be able to:

9. Describe enzyme structure and activity and the role of enzymes in metabolism.

10. Explain the cellular respiration process in terms of the pathways of Glycolysis, pyruvate oxidation, Krebs's Cycle and Oxidative Phosphorylation and fermentation.
12. Explain the photosynthesis process in terms of cyclic vs. non-cyclic photophosphorylation and the Calvin-Benson cycle including C3, C4 and CAM.

D. Explain how genetic traits are expressed and inherited and the role of genetic mutations in changing traits and causing disease

In order to do this, students need to complete the reading assignments and homework, watch the prezis, participate in in-class lectures, discussion and activities and study the material, so that they will be able to:

13. Describe the structure of chromosomes in terms of chromatin, chromatid, centromere, histones and nucleosomes
14. Explain Mendel's laws of inheritance and define the following terms: gene, allele, locus, dominant, recessive, codominant, linkage, phenotype, genotype, homozygous, and heterozygous.
15. Apply the laws of inheritance to solve genetics problems using punnet squares, pedigree analysis.
16. Discuss some common forms of human genetic diseases and the mutations that cause them.
17. Describe the structure of DNA and the process of DNA replication.
18. Describes of roles of RNA and its structure and describe the process of transcription.
19. Explain the gene-protein relationship, the process of protein synthesis and the control of gene-expression in both prokaryotic and eukaryotic organisms. Describe protein processing.
20. Identify and describe the events that occur during the stages of the cell cycle, mitosis, binary fission and meiosis. The role of cell cycle control in cancer.
21. Explain biotechnology techniques and discuss their applications.

E. Explain evolution as an underlying theme in biology

Competencies

Scientific Reasoning: Upon the completion of this course, students should be able to:

1. Explain the methods of scientific inquiry that lead to the acquisition of knowledge. Such methods include observations, testable hypotheses, logical inferences, experimental design, data acquisition, interpretation, and reproducible outcomes.
2. Apply scientific methods to investigate real-world phenomena, and routine and novel problems. This includes data acquisition and evaluation, and prediction.
3. Represent scientific data symbolically, graphically, numerically, and verbally.
4. Interpret scientific information and draw logical references from representations such as formulas, equations, graphs, tables, and schematics.
5. Evaluate the results obtained from scientific methods for accuracy and/or reasonableness

Scientific Knowledge: Upon the completion of this course, students should be able to:

1. Communicate using appropriate scientific terminology.
2. Use representations and models to communicate scientific knowledge and solve scientific problems.
3. Plan and implement data collection strategies appropriate to a particular scientific question.
4. Articulate the reasons that scientific explanations and theories are refined or replaced.
5. Evaluate the quality of scientific information on the basis of its source and the methods used to generate it.

Laboratory Skills: A student successfully completing the laboratory course should be able to demonstrate the following skills:

1. Properly focus a light microscope and/or dissecting microscope to view specimens
2. Identify cell structure on slides using a light microscope

3. Prepare and view wet mount slides
4. Demonstrate proper laboratory safety procedures for handling chemicals and other laboratory materials
5. Properly measure liquid chemicals using a graduated cylinder and/or pipette
6. Accurately record volume measurements using a graduated cylinder and/or pipette
7. Accurately determine the pH of a solution
8. Conduct experiments involving chemical and biological principles such as diffusion and osmosis, pH, and enzyme activity
9. Safely and Properly mix chemicals (ie acids and bases into water)
10. Perform scientifically sound and safe experiments
11. Use standard laboratory equipment correctly and record data to reflect the accuracy of the instrument
12. Select and use appropriate personal protective equipment
13. Successfully follow laboratory procedures, record observations and report their findings in written laboratory reports using the scientific method