



MERCER
COUNTY COMMUNITY COLLEGE

COURSE OUTLINE

Course Number BIO 113	Course Title Biological Science Concepts	Credits 3
Hours: Lecture/Lab/Other 2 lecture/2 lab	Co- or Pre-requisite MAT 037 or MAT 042 or Proficiency in basic algebra	Implementation Semester & Year Spring 2022

Catalog description

Survey of fundamental concepts, principles, and phenomena in biology. Provides a solid scientific basis on which opinions relating to issues in biology can be developed. Topics include diversity of life, cell biology, inheritance, biotechnology, and body processes. Lab exercises employ the scientific method and reinforce lecture concepts. Designed for the non-science major or as a foundational course.

General Education Category:

Goal 3: Science

Course coordinator:

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Required texts & Other materials:

Concepts of Biology – OpenStax College

<https://openstaxcollege.org> (customized edition found on Blackboard)

Laboratory Manual for BIO113, 10th edition <https://open.umn.edu/opentextbooks/textbooks/unfolding-the-mystery-of-life-biology-lab-manual-for-non-science-vmajors> (found on Blackboard)

Course Student Learning Outcomes (SLO):

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

1. Investigate unifying features of living things and explore the diversity of life on earth. [Supports ILG #1, 3, 4, 10 & 11]
2. Examine natural selection and evolutionary biology. [Supports ILG #1, 3, 4, 10 & 11]
3. Explore structures and functions of cells, tissues, and organ systems in multicellular organisms. [Supports ILG #1, 3, 4 & 10]
4. Investigate chromosomes and gene inheritance. [Supports ILG #1, 3, 4, 10 & 11]
5. Relate aspects of normal cell division to abnormal growth in cancer cells. [Supports ILG #1, 3, 4, 10 & 11]
6. Analyze DNA structure and function and apply knowledge to technology. [Supports ILG #1, 3, 4, 9, 10 & 11]
7. Investigate the germ theory of disease and explore mechanisms utilized by infectious agents and effects on the human population. [Supports ILG #1, 3, 4, 7, 10 & 11]
8. Develop skills in observation, hypothesis construction, analysis of data, and application of the scientific method in an inquiry-based laboratory setting. [Supports ILG #1, 2, 3, 4, 10 & 11]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 1. Written and Oral Communication in English: Students will communicate effectively in both speech and writing

Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Institutional Learning Goal 3. Science. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Institutional Learning Goal 7. History. Students will understand historical events and movements in World, Western, non-Western or American societies and assess their subsequent significance.

Institutional Learning Goal 9. Ethical Reasoning and Action. Students will understand ethical frameworks, issues, and situations.

Institutional Learning Goal 10. Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Units of study in detail – Unit Student Learning Outcomes:

Unit I Biological Diversity, Scientific Method, Evolution [Supports Course SLO # 1, 2, & 8]

Learning Objectives

The student will be able to:

- Engage in the process of science including the posing of a testable, falsifiable hypothesis.
- Analyze the use of experimental variables, experimental and control groups, controlled variables, placebos, blind and double blind experiments.
- Explore the contribution Darwin made to the understanding of evolution by natural selection and how his travels influenced his thinking.
- Synthesize aspects of natural selection including random variation, survival of the fittest, reproductive success, and descent with modification into an overarching scenario of evolution.
- Develop competency in conducting metric measurement and use of the light microscope.

Unit II Cell Biology, Inheritance of Traits [Supports Course SLOs 3, 4, & 8]

Learning Objectives

The student will be able to:

- Compare and contrast the two types of cells: prokaryotic and eukaryotic.
- Investigate the architecture and function of the plasma (cell) membrane, the function of membrane proteins and select eukaryotic organelles.
- Examine Mendel's Laws and generate Punnett Squares to solve single trait crosses.
- Analyze models of genetic inheritance including: pleiotropy, incomplete dominance, polygenic inheritance, and x-linked recessive traits.
- Relate the number of chromosomes in sperm and egg to genetic chromosomal number disorders in humans, including monosomic and trisomic genetic disorders.
- Examine homologous chromosomes in a human karyotype and detect translocations, deletions, and inversions discussing the potential effects of these genetic abnormalities.
- Apply an understanding of the techniques of karyotyping, amniocentesis, chorionic villi sampling, and preimplantation testing to fetal genetic typing, discussing the ethical implications of genetic testing and sex selection and genetic profiling.
- Employ aspects of the scientific method to perform colorimetric tests for biomolecules and discover the role of catalase enzyme in eukaryotic organisms
- Analyze the release of oxygen and utilization of carbon dioxide by plants during photosynthesis.

Unit III Cell Division, Cancer, DNA, Biotechnology [Supports Course SLOs # 5, 6, & 8]

Learning Objectives

The student will be able to:

- Analyze changes exhibited by cancer cells comparing malignant and benign tumors, treatment options, and risk factors.
- Explain why cancer is a "multi-hit" genetic disease, examining the changes exhibited by cancer cells and treatment options.
- Define DNA, genetic code, genes, double helix, nucleotide, and genome; calculate the complementary strand of DNA given a particular DNA sequence.
- Evaluate materials required body tissue sources to obtain material for DNA fingerprinting, examining various uses of DNA fingerprinting such as paternity testing and criminal investigations using gel electrophoresis.
- Apply an understanding of recombinant DNA technology and the use of transgenic organisms for medical and commercial uses.
- Differentiate therapeutic cloning from reproductive cloning, investigating the origin and use of stem cells to treat disease and evaluating the concepts of undifferentiated cells and the difference between an embryo and a stem cell line.
- Isolate DNA from plant cells.
- Compare the four principle types of animal tissue, identify tissues types and structures in an organ specimen.

Unit IV Disease and the Immune System [Supports Course SLOs # 7 & 8]

Learning Objectives

The student will be able to:

- Examine the Plague (black death) and its transmission from flea to rats to humans and the impact of the plague in the Middle Ages.
- Describe key characteristics of diseases caused by the following bacterial agents: viruses, prions, bacteria, protists, fungi and parasites.

- Recognize organs of the lymphatic system including red bone marrow, the thymus gland, spleen, and lymph nodes, contrasting the role of the immune system in autoimmune disease.
- Distinguish between specific and nonspecific body defense systems and between self-antigens, foreign antigens, and antibodies, differentiating the roles B lymphocytes and T lymphocytes in specific immunity and the effect of immunization.
- Examine the evolution of mammalian red blood cells, compare and contrast mammalian, fish, and amphibian red blood cells, and determine blood type of simulated blood donors and recipients.
- Determine the optimal conditions for bacterial and fungal growth.
- Utilize the process of fermentation to make yogurt describing organisms used in fermented foods and well as food-borne pathogens.

Evaluation of student learning:

Questions on exams are from lecture, lecture quizzes, reading assignments, handouts, or other material presented. It is the student's responsibility to be present at **and on time** for all exams. *There are no regular makeup exams.* A student who misses an exam must contact the instructor within 12 hours. A student who misses an exam AND has contacted the instructor within the designated time will be allowed to take an essay makeup exam. Discussion boards, essays, or additional assignments may be added as per the instructors' discretion.

A 20-point quiz will be completed on Blackboard after each lab session, Your instructor will provide you with exact due dates. If you are absent from lab you will receive a "0" on that week's lab quiz. Missed laboratories cannot be made up. Any potential problems should be discussed in advance with the laboratory instructor. The 2 lowest laboratory grades are dropped.

All tests, Blackboard quizzes, laboratory grades, and class attendance contribute to the final grade. The laboratory grade is approximately 30% of the final grade for the course.

<u>Assignment</u>	<u>Number@point value</u>	<u>Total Point Value</u>
Lecture exams	4 @ 100	400
Lab Quizzes (online - Blackboard)	11 @ 20 (2 lowest dropped)	220
Lecture Quizzes (online - Blackboard)	16 @ 5 (2 lowest dropped)	80
TOTAL POINTS		<u>700</u>
Final Grade	(total points / 7.0)	

A	93-100%	B+	87-89%	C+	77-79%	D	60-69%
A-	90-92	B	83-86	C	70-76	F	<60%
		B-	80-82				