Course Number and Title: BIO 140 General Biology

Campus Location:
Georgetown, Dover, Stanton, Wilmington

Effective Date:
2021-51

Prerequisite:
ENG 090 or ENG 091, SSC 100 or concurrent

Co-Requisites:
None

Course Credits and Hours:
4.00 credits
3.00 lecture hours/week
2.00 lab hours/week

Course Description:
This course discusses biological concepts, including basic cellular chemistry, cell structure and function, life processes, genetics, biodiversity of organisms, evolution and natural selection, human reproduction and development, and interaction of organisms with their environment.

Required Text(s):
Obtain current textbook information by viewing the campus bookstore - https://www.dtcc.edu/bookstores online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:
None

Schedule Type:
Classroom Course
Hybrid Course

Disclaimer:
None

Core Course Performance Objectives (CCPOs):

1. Explain the basic properties and chemistry of life, and demonstrate how the scientific method is used as a means of understanding specific subjects or processes. (CCC 2, 7)
2. Compare the basic structural and functional characteristics of eukaryotic and prokaryotic cells. (CCC 2)
3. Analyze the basic processes and principles of photosynthesis, cellular respiration, cell division, genetics, and heredity. (CCC 2, 7)
4. Explain the basic structure and replication of viruses and the characteristics of bacteria, protists, fungi, and plants. (CCC 2)
5. Show the classification and characteristics of animals with emphasis on human reproduction and development. (CCC 2)
6. Discuss Darwin's theory of evolution and the basic environmental interactions involved in Earth's ecosystems. (CCC 2)
7. Integrate laboratory and didactic principles and experiences with emphasis on microscopy, chemistry, cell structure, metabolism, cell division, genetics, classification, bacteria, protists, fungi, plants, animals, reproduction, and development. (CCC 1, 2, 3)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):
Upon completion of this course, the student will:

1. Explain the basic properties and chemistry of life, and demonstrate how the scientific method is used as a means of understanding specific subjects or processes.
   1. Describe the scientific process, including observation, hypothesis, predictions, experimentation, and conclusion.
   2. Describe the difference between deductive and inductive reasoning.
   3. List and describe the properties demonstrated by living things, including movement, sensitivity, cellular organization, metabolism, homeostasis, reproduction, and heredity.
   4. Describe the basic structure of an atom.
   5. Explain how electrons determine how atoms interact.
   6. Describe ionic, covalent, and hydrogen bonds.
   7. List the biologically important characteristics of water that are due to its high polarity and hydrogen bonding.
   8. Describe the four major classes of organic molecules used by cells, their function, and their building blocks.
2. Compare the basic structural and functional characteristics of eukaryotic and prokaryotic cells.
1. Describe the basic ideas associated with the cell theory.
2. Explain why cells are generally very small.
3. Describe the structure and function of the plasma membrane.
4. Explain what drives the process of diffusion.
5. Explain osmosis, and relate osmosis to hypotonic and hypertonic conditions.
6. Discuss the importance of active transport and the sodium-potassium pump.
7. List the functions of the plasma membrane proteins, including how cells get chemical and electrical information.
8. Explain that bacteria, as prokaryotes, are the simplest of cells.
9. Compare the structure of prokaryotic and eukaryotic cells.
10. Describe how eukaryotic cell structure can lead to greater complexity within the cell.
11. Explain the functions of the cytoskeleton of the cell.
12. Describe the functions of the cell nucleus and other cytoplasmic organelles.
13. Explain how complex cells may have arisen from symbiotic associations between simple cells.

3. Analyze the basic processes and principles of photosynthesis, cellular respiration, cell division, genetics, and heredity.
   1. Indicate how chemical reactions in cells involve the making or breaking of chemical bonds.
   2. Explain how an enzyme works.
   3. Describe the qualities of adenosine triphosphate (ATP) that lend to its use as the cell’s energy currency.
   4. Describe the basic stages and summary chemical reaction for photosynthesis.
   5. Indicate the importance of photosynthesis for life on Earth.
   6. List the stages of cellular respiration.
   7. Explain where the stages of cellular respiration occur, which ones require oxygen, and the energy yield of each stage.
   8. Describe the possible fates of the end products of glycolysis.
   9. Explain how prokaryotic binary fission occurs.
   10. State the events that occur in the stages of mitosis.
   11. Describe the difference between cytokinesis in animal and plant cells.
   12. List the stages of meiosis.
   13. Compare the outcome of meiosis with that of mitosis.
   14. Describe the double helix structure of deoxyribonucleic acid (DNA).
   15. Describe the structure of ribonucleic acid (RNA) and its role in the processes of transcription and translation.
   16. Describe genetic engineering, and list ways in which agriculture has or may be transformed by genetic engineering.
   17. List examples of medical advances produced by inserting genes into bacteria.
   18. Explain the purpose of the Human Genome Project.
   19. List the uses for gene therapy and DNA fingerprinting.
   20. State who Gregor Mendel was and why his work is foundational to modern genetics.
   21. Discuss the basic tenets of genetics and distinguish among the terms dominant, recessive, homozygous, and heterozygous.
   22. State Mendel's first two laws of heredity.
   23. Construct a Punnett square to illustrate Mendel's first two laws of heredity.
   24. Describe how genes are located on chromosomes.
   25. Describe various inheritance patterns, including multiple alleles, incomplete dominance, and codominance.
   26. State the number of chromosomes in normal human cells, explain what causes abnormal number of chromosomes, and describe some specific examples.
   27. Define sex-linked genes, and give examples.
   28. List and describe some important human heredity disorders and the role of genetic counseling for parents who may be at risk for genetic transmission to their children.

4. Explain the basic structure and replication of viruses and the characteristics of bacteria, protists, fungi, and plants.
   1. Describe the structure of a bacterial cell.
   2. Name and describe the three basic structural types of bacteria.
   3. Describe the differences between the two major groups of bacteria: the archaebacteria and the eubacteria.
   4. Explain what a virus is and how it is structured.
   5. Describe how viruses invade living cells.
   7. Describe the general characteristics of protists.
   8. List the seven major groups of protists and their general characteristics.
   9. Describe some commercial uses of protists.
   10. Describe the ways that fungi differ from plants.
   11. Describe the structure and function of mycelium.
   12. List fungi that are economically important.
   13. List fungi that are disease-producing.
   14. Describe the important role of fungi in the biosphere.
   15. Describe three primitive plants (i.e. liverworts, hornworts, and mosses).
   16. List the different types of specialized cells in vascular tissue.
   17. Describe the structure and life cycle of a fern.
   18. Give examples and list differences between gymnosperms and angiosperms.
   19. Describe the structure of a flower.
   20. Explain the adaptive significance of fruits.

5. Show the classification and characteristics of animals with emphasis on human reproduction and development.
   1. Describe the difference between an invertebrate and a vertebrate.
2. Identify and list some important characteristics of the following invertebrates:
   1. sponges (phylum Porifera)
   2. jellyfish and corals (phylum Cnidaria)
   3. comb jellies (phylum Ctenophora)
   4. tapeworms and flukes (phylum Platyhelminthes)
   5. roundworms (phylum Nematoda)
   6. rotifers (phylum Rotifera)
   7. clams, snails, and squids (phylum Mollusca)
   8. earthworms and leeches (phylum Annelida)
   9. crabs, insects, and spiders (phylum Arthropoda)
   10. starfish, sea urchins, and sand dollars (phylum Echinodermata)

3. Identify and list some important characteristics of chordates (phylum Chordata) including:
   1. sharks (class Chondrichthyes)
   2. fish (class Osteichthyes)
   3. frogs, salamanders, and toads (class Amphibia)
   4. snakes, lizards, alligators, and crocodiles (class Reptilia)
   5. birds (class Aves)
   6. mammals, including humans (class Mammalia)

4. Use a classification key to identify various organisms.

5. Describe the anatomy and physiology of the male and female reproductive systems.

6. Discuss Darwin's theory of evolution and the basic environmental interactions involved in Earth's ecosystems.
   1. Explain how Charles Darwin's five-year voyage on the HMS Beagle led to developing his ideas on evolution and natural selection.
   2. List the categories of evidence for evolution.
   3. Describe and give examples to illustrate the difference between natural and artificial selection.
   4. Explain speciation.
   5. Define and give an example of an ecosystem.
   6. Describe the differences between producers and consumers, and give examples of each.
   7. Describe the difference between a food chain and a food web.
   8. Describe some important cycles in an ecosystem, including the water, carbon, nitrogen, and phosphorous cycles.
   9. List, describe, and give examples of associated plants and animals living within Earth's major ecosystems.
   10. Describe various ways that man has disrupted Earth's ecosystems.
   11. List examples of air and water pollution and their effects on the local and global environment.
   12. Define and describe the cause of the greenhouse effect and acid rain.

7. Integrate laboratory and didactic principles and experiences with emphasis on microscopy, chemistry, cell structure, metabolism, cell division, genetics, classification, bacteria, protists, fungi, plants, animals, reproduction, and development.
   1. Explain the proper use and care of the light microscope.
   2. Describe the structure and functions of the parts of the light microscope.
   3. List and describe some methods of identification of organic molecules in the laboratory.
   4. Identify methods of chemical transport in the laboratory setting.
   5. Identify and describe the cell structures visible through the light microscope.
   6. Demonstrate the function of enzymes as seen in the laboratory.
   7. Explain fermentation, cellular respiration, and photosynthesis as seen in the laboratory.
   8. Identify the stages of cell division.
   9. Compare selected genetic traits and their inheritance.
   10. Identify and classify selected members of the kingdoms Monera, Protista, and Fungi.
   11. Identify and classify selected members of the kingdom Plantae and their structures.
   12. Identify and classify selected members of the kingdom Animalia and their structures.
   13. Identify selected structures of the human reproductive system.
   14. Compare the major structural changes seen in early human development.

Evaluation Criteria/Policies:
The grade will be determined using the Delaware Tech grading system:

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<td>A</td>
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<td>B</td>
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<td>C</td>
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Students should refer to the Student Handbook - https://www.dtcc.edu/handbook for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.
Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):
None

Disabilities Support Statement:
The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the disabilities services - https://www.dtcc.edu/disabilitysupport web page or visit the campus Advising Center.