BIOL 112 – Evolution, Form and Function of Organisms – COVID 19 Semester

FALL, 2020
SECTION 01, MWF, 10:00 – 10:50 AM, 101 Rita Liddy Hollings Science Center (RITA)

INSTRUCTOR:	Dr. Jean Everett – pronouns she/her
OFFICE:	215 RITA
OFFICE HOURS:	Fridays ~12-2pm; I will be avoiding my office, but I will set up Zoom for that time. I'm happy to Zoom at other times when mutually convenient.
OFFICE PHONE:	843-953-7843 – messages come to my email
MAILBOX:	Biology Department Office, 255 RITA
EMAIL:	everettj@cofc.edu (if I don't respond, please try again or phone me)
WEBPAGE:	**OAKS** *and* http://everettj.people.cofc.edu/BIOL112.html
SI LEADER:	Shem Navarro

PREREQUISITES: BIOL 111, lecture and lab, or equivalent
PREREQUISITE OR COREQUISITE: BIOL 112 lab

TEXT: Biological Science, 6th or 7th edition, Freeman, et al

COURSE PRESENTATION: while we are off campus, lectures will be presented **synchronously** via Zoom. You should find the invitations on your OAKS calendars. Lectures will not be recorded, and you will not be allowed to record them. I encourage you to image graphics, many of which are also in your text. The lectures will be on OAKS, but without images for legal copyright issues. If you are curious, I encourage you to preview the "before" lectures on the people page.

COURSE OBJECTIVES:
- to improve your skills in critical, scientific thinking and logical reasoning
- to give you an introductory foundation in the processes of evolution, the unity and diversity of organisms, and the structure and function of plants and animals

GRADE:
Three mid-term exams = 60%
Quizzes and assignments = 25%
- mandatory SI in the first two weeks of SI

Comprehensive final exam = 15%

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GRADING SCALE				
	88-89% = B+	78-79% = C+	68-69%=D+	
93-100% = A	83-87% = B	73-77% = C	63-67%=D	
90-92% = A-	80-82% = B-	70-72% = C-	60-62%=D-	<60%=F

PLEASE NOTE:

- Quizzes are unscheduled and will be distributed at 10:00AM via OAKS. They will be due back at the beginning of the following class period. All quizzes and exams will be processed through Akindi. The final exam will be some sort of rigorous reflection rather than the typical multiple choice exam. Midterm exams will be timed.
- Absence Policy – the Administration has requested that we be understanding about absences during this stressful time. Thus, there is no formal attendance policy for this semester. However, you can't learn if you don't attend class and complete quizzes. In an emergency, contact me **as soon as possible** for makeup arrangements if you have a legitimate reason for missing a quiz or exam. I will trust you to be honest. See next point.

ACADEMIC INTEGRITY: I expect each of you to work independently unless specifically instructed otherwise, and to adhere to the College of Charleston Honor System as described in the Student Handbook.

SPECIAL NEEDS: If you will need any special accommodations to complete the requirements for this course, please contact me as soon as possible.

ALLY PROGRAMS: I am a Safe Zone Ally and a Green Zone Ally, and happy to assist.

INCLEMENT WEATHER: Our tentative schedule has slush room built in case we have to close campus for a weather event. In addition, there may be scheduled make-up days.

FOOD AND HOUSING INSECURITY: If you are not economically secure in food and/or housing, the College has assistance programs. You may contact the Dean of Students directly, or I will be most happy to confidentially facilitate assistance.

COVID 19: This will be a challenging semester for all of us. When we are back on campus, you are required to wear a mask and to distance on campus, and, **please**, off campus as well. We all at the College are committed to kindness, and to practicing patience and empathy. If you begin to feel overwhelmed, I am happy to talk to you and urge you to seek counseling if needed. Please contact me if you don't feel I'm meeting your needs.

TENTATIVE SCHEDULE

DATE		TOPIC	CHAPTER
26	Aug.	Introduction	1 (review)
28	Aug.	Evolution by natural selection	22
31	Aug.	Evolution by natural selection, continued – **labs begin; last drop/add**	
2	Sept.	Evolution of populations	23
4	Sept.	Evolution of populations, continued	

DATE		TOPIC	CHAPTER
7	Sept.	Speciation	24
9	Sept.	Speciation, continued	
11	Sept.	Plant structure, growth and development	34
14	Sept.	Plant structure, growth and development, continued	
16	Sept.	Plant structure, growth and development, continued	
18	Sept.	**EXAM 1**	
21	Sept.	Vascular plant transport	35
23	Sept.	Vascular plant transport, continued	
25	Sept.	Vascular plant transport, continued	
28	Sept.	Plant nutrition and soils	36
30	Sept.	Plant nutrition and soils, continued	
2	Oct.	Plant nutrition and soils, continued	
5	Oct.	Angiosperm reproduction	38 & 21
7	Oct.	Angiosperm reproduction, continued	
9	Oct.	Angiosperm reproduction, continued	
12	Oct.	Animal form and function	39
14	Oct.	Animal form and function, continued	
16	Oct.	**EXAM 2**	
19	Oct.	Osmoregulation	40
21	Oct.	Osmoregulation, continued	
23	Oct.	Osmoregulation, continued	
26	Oct.	Animal nutrition	41
28	Oct.	Animal nutrition, continued – **LAST DAY TO WITHDRAW**	
30	Oct.	Animal nutrition, continued	
2	Nov.	Circulation and gas exchange	42
3	**Nov.**	**PLEASE VOTE – if not local, please apply soonest for your AB**	
4	Nov.	Circulation and gas exchange, continued	
6	Nov.	**EXAM 3**	
9	Nov.	Circulation and gas exchange, continued	
11	Nov.	Circulation and gas exchange, continued	
13	Nov.	The immune system	48

DATE		TOPIC	CHAPTER
16	Nov.	The immune system, continued	
18	Nov.	The immune system, continued	
20	Nov.	The immune system, continued	
23	Nov.	Electrical signaling in the nervous system	43
25	Nov.	Thanksgiving Holiday	
27	Nov.	Thanksgiving Holiday	
30	Nov.	The nervous system, continued	
2	Dec.	The nervous system, continued	
4	Dec.	Mandatory Evaluations / Ecotour / Review	
9	Dec.	**COMPREHENSIVE FINAL EXAM, due by 10 AM**	

General Education Student Learning Outcomes

Introduction to Cell and Molecular Biology/Evolution, Form, and Function of Organisms
BIOL 111 & 111L/BIOL 112 & 112L
Department: Biology

Learning Goals & Objectives

This general education science sequence provides a background for understanding and evaluating contemporary topics in biology. Students develop a foundational understanding of core concepts to use and on which to expand in upper level courses. They also develop the critical competencies that form the bases for the practice of science and use of scientific knowledge.

Core Concepts

This 2-semester course sequence in general biology addresses fundamental principles in biology to prepare students for sophomore and upper level courses in biology:

- EVOLUTION: The diversity of life evolved over time by processes of mutation, selection, and genetic change. The theory of evolution by natural selection allows scientists to understand patterns, processes, and relationships that characterize the diversity of life.
- STRUCTURE AND FUNCTION: Basic units of structure define the function of all living things. Structural complexity, together with the information it provides, is built upon combinations of subunits that drive increasingly diverse and dynamic physiological responses in living organisms. Fundamental structural units and molecular and cellular processes are conserved through evolution and yield the extraordinary diversity of biological systems seen today.
- INFORMATION FLOW, EXCHANGE, AND STORAGE: The growth and behavior of organisms are activated through the expression of genetic information at different levels of biological organization and depend on specific interactions and information transfer.
- PATHWAYS AND TRANSFORMATIONS OF ENERGY AND MATTER: Biological systems grow and change by processes based upon chemical transformation pathways and are governed by the laws of thermodynamic and will be explored to understand how living systems operate, how they maintain orderly structure and function, and how physical and chemical processes underlie processes at the cellular level (i.e. metabolic pathways, membrane dynamics), organismal level (i.e. homeostasis) and ecosystem level (i.e. nutrient cycling).
- SYSTEMS: Living systems are interconnected and interacting and biological phenomena are the result of emergent properties at all levels of organization, from molecules to ecosystems to social systems. The course will explore the dynamic interactions of components at one level of biological organization to the functional properties that emerge at higher organizational levels.

The specific topics covered in each course include:

Biology 111 & Biology 111L

- Chemical and physical properties of life
- Cell form & function
- Energetics, metabolism, and photosynthesis
- The cell cycle
    - Mitosis and cell reproduction
    - Meiosis and sexual reproduction
- Mendelian genetics / Patterns of inheritance
- Human Inheritance
- The molecular basis of inheritance
- DNA and protein production
- Regulation of gene expression
- Some aspects of biotechnology

Biology 112 & Biol 112 L

- The development of evolutionary thinking
- Basic evolutionary processes
- Comparative plant form & function
- Comparative animal form & function

Core Competencies

- **Nature of Scientific Knowledge**
    - Understand the intellectual standards used by scientists to establish the validity of knowledge, evidence, and decisions about hypothesis & theory acceptance. These standards include: 1) science relies on external and naturalistic observations, and not internal convictions; 2) scientific knowledge is based on the testing of hypotheses and theories, which are under constant scrutiny and subject to revision based on new observations; 3) the validity of scientifically generated knowledge is established by the community of scientists through peer review and open publication of work.
    - Understand that new ideas in science are limited by the context in which they are conceived; are often rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly, through contributions from many investigators.
    - Understand that science operates in a world defined by the laws of chemistry and physics.
    - Understand the differences and relationships among scientific theories, hypotheses, facts, laws, & opinions.
    - Understand the differences between science and technology, but also their interrelations.
    - Understand the dynamic (tentative) nature of science.

- **Scientific Methods of Discovery**
  - [1]Understand the methods scientists use to learn about the natural world (observing; questioning; formulating testable deductive hypotheses; controlled experimentation when possible; observing a wide range of natural occurrences and discerning (inducing) patterns).
  - Apply physical/natural principles to analyze and solve problems**.**
- **Develop a Scientific Attitude**
  - Develop habits of mind that foster interdisciplinary and integrative thinking (within biology; between biology and other sciences; between science and other disciplines).
  - Develop an appreciation for the scientific attitude - a basic curiosity about nature and how it works.
- **Develop scientific analysis and communication skills**
  - Develop quantitative reasoning skills (quantitatively expressing the results of scientific investigations, or patterns in nature and using knowledge of biological concepts to explain quantitatively-expressed data or patterns).
  - Understand the probabilistic nature of science and the use/application of inferential statistics to test hypotheses.
  - Develop scientific information literacy (library, internet, databases etc…); find and evaluate the validity of science-related information.
  - Communicate scientific knowledge, arguments, and ideas in a variety of different contexts (scientific, social, cultural), utilizing a variety of different media (scientific articles, policy statements, editorials, oral presentations etc.).
  - Develop cooperative problem-solving skills (working effectively in teams), but also habits of mind and skills that foster autonomous learning.
- **Develop an appreciation for the impact of science on society.**
  - Develop an appreciation of humans as a part of the biosphere and the [2]impact of biological science on contemporary societal/environmental concerns.
  - Knowledge of the history of the biological sciences and the influences of politics, culture, religion, race, and gender on the scientific endeavor.

Signature assignments for measuring learning outcomes

Learning Outcome 1: Students apply physical/natural principles to analyze and solve problems. This learning outcome is assessed using the poster (or scientific article) generated in Biology 112 lab as part of the multi-week student-directed independent research project. In this project students use data they collect (or has been collected in actual research investigations) to test an hypothesis of their choosing. These projects may be themed, with all student groups addressing different aspects of a larger question, emphasizing the interdependence of various research groups needed to address complicated problems. This multi-week project begins the class identifying what questions need to be addresses in the larger problem. Individual student groups then become experts in these areas of the larger problem. The smaller research teams develop a hypothesis, and write a research proposal to test their hypothesis. Students collect (or use already collected data), summarize and statistically analyze the data, and draw conclusions.

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[1] This learning goal will be measured as part of the general education assessment. The specific learning outcome to be measured is: *Students can apply physical/natural principles to analyze and solve problems.*

[2] This learning goal will be measured as part of the general education assessment. The specific learning outcome to be measured is: *Students can demonstrate an understanding of the impact that science has on society.*

Learning Outcome #2 - Students demonstrate an understanding of the impact that science has on society.

Biology 112 lab Students produce a written document based on one of the case-based labs (examples - policy statement, article, stake-holder professional letter or poster) that requires them to research and apply biological knowledge or evidence to defend or critique a proposed solution to a biology-related societal issue. Although the choice of the specific issue or proposed solution is course-section specific, some examples of potential issues include

- exploring environmental/health impacts of genetically modified organisms
- the use of performance enhancing drugs in sports
- the development of antibiotic resistance in disease organisms