

# BIOL 112 – Evolution, Form and Function of Organisms

**SPRING, 2019**

SECTION 03, MWF, 10:00 – 10:50 AM, 154 Rita Liddy Hollings Science Center (RITA)

**INSTRUCTOR:** Dr. Jean Everett  
**OFFICE:** 215 RITA  
**OFFICE HOURS:** Fridays 12-2pm; I will be in my office at other times (especially many Wednesday afternoons) and you are welcome to stop in.  
**OFFICE PHONE:** 843-953-7843 – we have VoIP that will send me messages by email  
**MAILBOX:** Biology Department Office, 255 RITA  
**EMAIL:** everettj@cofc.edu (if I don't respond, please try again or phone me.)  
**WEBPAGE:** <http://everettj.people.cofc.edu/BIOL112.html> – note, **NOT OAKS**  
**SI LEADER:** Shayna Faust

**PREREQUISITES:** BIOL 111, lecture and lab, or equivalent  
**PREREQUISITE OR CO-REQUISITE:** BIOL 112 lab

**TEXT:** Biological Science, 6<sup>th</sup> edition, Freeman, et al

## 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 in-class exams = 60%

Quizzes and assignments = 25%

- mandatory SI in the first two weeks

Comprehensive final exam = 15%

All in class exams will be multiple choice – you **must** bring a #2 pencil to fill out the scannable answer sheet

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. Latecomers will not be permitted full credit for the quiz. Your final grade will be reduced by 10% if you miss 5 or more quizzes.
- No student will be permitted to begin an exam if any student has already completed the exam.
- No makeups will be given for exams or quizzes without prior notice and a documented absence memo from the Student Affairs Absence Memo Office. If you are too sick to come to class, you

are sick enough to see a doctor. In an emergency, contact me **as soon as possible** for makeup arrangements.

**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.

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

## **TENTATIVE SCHEDULE**

<b><u>DATE</u></b>	<b><u>TOPIC</u></b>	<b><u>CHAPTER</u></b>
9 Jan.	Introduction	1 (review)
11 Jan.	Evolution by natural selection	22
14 Jan.	Evolution by natural selection, continued – <b>labs begin; last drop/add</b>	
16 Jan.	Evolution of populations	23
18 Jan.	Evolution of populations, continued	
21 Jan.	<b>MLK Holiday</b>	
23 Jan.	Speciation	24
25 Jan.	Speciation, continued	
28 Jan.	Plant structure, growth and development	34
30 Jan.	Plant structure, growth and development, continued	
1 Feb.	Plant structure, growth and development, continued	
4 Feb.	<b>EXAM 1</b>	
6 Feb.	Vascular plant transport	35
8 Feb.	Vascular plant transport, continued	
11 Feb.	Vascular plant transport, continued	
13 Feb.	Plant nutrition and soils	36
15 Feb.	Plant nutrition and soils, continued	

<u>DATE</u>	<u>TOPIC</u>	<u>CHAPTER</u>	
18	Feb.	Plant nutrition and soils, continued	
20	Feb.	Angiosperm reproduction	38 & 21
22	Feb.	Angiosperm reproduction, continued	
25	Feb.	Angiosperm reproduction, continued	
27	Feb.	Animal form and function	39
1	March	Animal form and function, continued	
4	March	<b>EXAM 2</b>	
6	March	Osmoregulation	40
8	March	Osmoregulation, continued	
11	March	Osmoregulation, continued	
13	March	Animal nutrition	41
15	March	Animal nutrition, continued	
18-22	Mar.	<b>Spring Break</b>	
25	March	Circulation and gas exchange – <b>LAST DAY TO WITHDRAW</b>	42
27	March	Circulation and gas exchange, continued	
29	March	Circulation and gas exchange, continued	
1	April	<b>EXAM 3</b>	
3	April	The immune system	48
5	April	The immune system, continued	
8	April	The immune system, continued	
10	April	The immune system, continued	
12	April	Electrical signaling in the nervous system	43
15	April	The nervous system, continued	
17	April	The nervous system, continued	
19	April	Review – bring questions	
22	April	Review – bring questions	
23	April	Ecotour / Review / Mandatory in Class Evaluations – bring a device	
<b>27</b>	<b>April</b>	<b>COMPREHENSIVE FINAL EXAM, 8 – 11 AM</b>	

## **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**
  - <sup>1</sup>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 <sup>2</sup>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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<sup>1</sup> 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.*

<sup>2</sup> 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