Biology 112: Evolution, Form and Function of Organisms

Section 2, Tues/Thur 1:40 – 2:55 PM RITA 154

Course Syllabus

Instructor: Dr. Heather Spalding
Office: RITA 206, Email: spaldinghl@cofc.edu
Spring 2019

Course Description:

- A foundation course for science majors providing an introduction to evolution with an emphasis on the structure, form and function of plants and animals. Students will be exposed to lectures, activities, readings, discussions, videos, and assessment to ensure a thorough, lasting understanding of the material. Completion of this class and the associated laboratory meets a General Education requirement.

Pre-requisites

- Successful completion of Biology/Honors 111/151, or a high grade in Biology 101. Biology 112 laboratory is normally a co-requisite, unless students already have credit for the laboratory portion of the course.

Course Learning 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.

Contact/Communication:

Private/Student-To-Instructor Contact

- Students should contact me about issues that are specific to the student **by email at spaldinghl@cofc.edu**
- My response time with emails will typically be **within 24 hours on weekdays and within 48 hours on weekends.**

Office Hours

- In person office hours (drop-in/group) in **RITA 206: Tuesdays 10:00AM – 12:00PM or by appointment.**

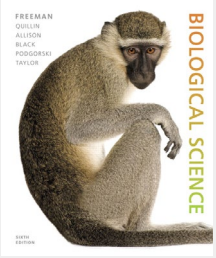
Course Communication and Community Building

- **OAKS** will be utilized for **content, quizzes, discussions, news, updates, and online office hours.** *New to Oaks?* Get up to speed fast with tutorials here: **http://blogs.cofc.edu/oaks/students/getting-started/**
- **Email** will be used to communicate important or sudden changes in course information.
- We will **all work together to build our classroom and online learning community.** I will play a facilitating role in helping you get to know, work with, trust, and collaborate with the other members of our class. Each member of the class must be willing to participate in a dynamic and engaging learning group that is inclusive. Your participation, willingness to contribute, and initiative are paramount to having a successful and enjoyable learning experience. We **aim to develop a spirit of camaraderie and team learning that will unite us** as a community of learners.

Expectations

- Students should plan to **log into Oaks at least 2 times per week.**
- Students should dedicate **6+ hours per week** to this course to be successful.
- This class is **student-driven**. Motivation must come from the student.
- Our class should be **interactive and engaging**! Students are expected to **contribute** to our **learning community.**
- **There are weekly obligations**: quizzes, graded assignments, or exams.
- **Laptops or tablets are not allowed in class** unless a need for accommodation is documented/discussed with the Instructor. Research clearly indicates that note taking by hand is a superior method of learning. You may audio record lectures, but please ask first.
- Please keep **phones** silenced and away during class time.

Required Course Materials



- **Computer/technology** with access to **internet**
- **Software/Apps**: OAKS, PowerPoint
- **Textbook**: Freeman, Biological Science 6th edition (used is great!)
- **#2 Pencil(s)** on exam days
- Basic scientific **calculator** (with exponents & square roots)

Supplemental Instruction (SI)

- We have SI scheduled for this class. Your SI leader is **Anam Abid.**
- Days and times for SI will be determined early in the semester.
- SI is for everyone! You are strongly encouraged to attend at least once a week.

Participation

- There is no formal attendance requirement, but you will not do well if you do not attend class. You are responsible for all material announced or discussed during class.

Late work

- Late homework assignments are not accepted.
- Late quizzes are not permitted without formal documentation and prior approval due to official College travel, weddings, and funerals. Excused absences due to serious medical issues spanning the entire quiz period may be considered for exemption on a case by case basis.

Inclement weather

- In the event of cancelled class(es) due to inclement weather, make up lectures will likely be available online through OAKS.

Accommodation

- SNAP students, disabled students, veterans, parents, commuters, nontraditional students, athletes, International, ESL, and all students with life circumstances that may warrant accommodations are encouraged to **discuss any concerns with the Instructor** in a timely manner. I understand that we all have many important things going on in our lives in addition to this biology class. I aim to be friendly, approachable, and understanding. But I will challenge you, and hold you to high standards.

Honor Code and Academic Integrity:

- We will adhere tightly to the CofC honor code. Lying, cheating, attempted cheating, unauthorized collaboration, keeping personal electronics such as cell phone or smart watch on your person during an exam, and plagiarism, whether intentional or not, are all clear violations of our Honor Code and will be reported to the Honor Board. For complete details regarding our updated honor code please see the following link: **http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php**

Assessment:

- Formative assessment quizzes are multiple-choice, individual, timed, randomized, approximately 10-15 questions, and conducted through OAKS. They are open-book and open-notes BUT students must study and prepare ahead of time, as quizzes are challenging and there will not be time to look up individual answers.
- Exams (summative assessment) will be in-class short answer/multiple choice exams emphasizing higher order cognition.
- Graded assignments will be submitted electronically to the OAKS drop box.

Grades calculated as follows:

Component	Value (% of final course grade)
Quizzes (8 of 9); lowest score dropped	**30%**
Exams (3)	**40%**
Cumulative Final Exam	**20%**
Graded assignments (3)	**10%**
TOTAL	**100%**

Grading scale:

A	**93-100**
A-	**90-92**
B+	**87-89**
B	**83-86**
B-	**80-82**
C+	**77-79**
C	**73-76**
C-	**70-72**
D+	**67-69**
D	**63-66**
D-	**60-62**
F	**less than 60**

Tentative Schedule for Section 2 T/Th class:

Week	Lecture topic	Chapter readings	Due for grading
1/8 – 1/10	Intro, syllabus, Natural Selection	Review Chp 1	**Syllabus quiz due 1/14** (OAKS online) must earn 100% unlimited tries.
1/15 – 1/17	Natural Selection and Evolution	22	**Quiz 1** (OAKS online) opens F 1/18 closes T 1/22 Average up to 3 tries
1/22 – 1/24	Evolution and Speciation	23	**Quiz 2** (OAKS online) opens F 1/25 closes M 1/28 Average up to 3 tries
1/29 – 1/31	Finish up evolution, **Exam 1**	24.1-24.2, 34	**Selfie #1 due T 1/29 to drop box** **Exam 1: Thursday, 1/31**
2/5 – 2/7	Plant structure, function, transport	34, 35	**Quiz 3** (OAKS online) opens F 2/8 closes M 2/11 Average up to 3 tries
2/12 – 2/14	Plant nutrition and response	36, 37	**Quiz 4** (OAKS online) opens F 2/15 closes M 2/18 Average up to 3 tries
2/19 – 2/21	Plant reproduction	38	**Quiz 5** (OAKS online) opens F 2/22 closes M 2/25 Average up to 3 tries
2/26 – 2/28	Plant repro., development, sustainability and agriculture. **Exam 2**	41	**Selfie #2 due T 2/26 to dropbox.** **Exam 2: Thursday, 2/28**
3/5 – 3/7	Intro to animal form and function, nutrition	39, 41	**Quiz 6** (OAKS online) opens F 3/8 closes M 3/11 Average of up to three tries
3/12 – 3/14	Animal gas exchange and circulation, Pi Day!	42	**3/14 – Pi day celebration in class**
3/19 – 3/21 no class	**SPRING BREAK**		
3/26 – 3/28 3/25: Last day to withdraw	Animal osmoregulation	40	**Quiz 7** (OAKS online) opens F 3/29 closes M 4/1 Average of up to three tries
4/2 – 4/4	Animal nervous system and neuromuscular junction	43, 45	**Quiz 8** (OAKS online) opens F 4/5 closes M 4/8 Average of up to three tries
4/9 – 4/11	Animal reproduction. **Exam 3**	47	**Exam 3: Thursday, 4/11**
4/16 – 4/18	Animal immunity	48	**Selfie #3, due 4/16 to dropbox** **Quiz 9** (OAKS online) opens F 4/19 closes M 4/22
Last day of class: Tuesday 4/23	Wrap up. Course evals, review for final.		**Course evaluations in class. Extra Credit packet due.**
4/30	**CUMULATIVE**	**FINAL EXAM**	**12:00 – 3:00 pm on APRIL 30**

General Education information:

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 *this course* include:

<u>Biology 112 & Biol 112 L</u>

- 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.

[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