

Biology 112: Evolution, Form and Function of Organisms

Section 11 MWF 9:30-10:20 AM HHWE 217

Course Syllabus

Instructor Deb Bidwell

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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, and assessment to ensure a thorough, lasting understanding of the material. Completion of this class and the associated laboratory meets a General Education requirement. For details please see the addendum at the end of this syllabus.

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 bidwelld@cofc.edu**
- My response turn around time with emails will be **within 24 hours on weekdays and within 48 hours on weekends.**

General Student-To-Instructor and Student-To-Student Contact

- Students should contact the Instructor and other students on issues that are not student-specific and may benefit or apply to the entire class using the **Discussion Board Hallway Conversations open 24 hours a day, 7 days a week.**
- My response turnaround time on the hallway conversations discussion board will be **within 24 hours weekdays and within 48 hours on weekends.**

Office Hours

- Online office hours with instant feedback in the **Chat room of Oaks On Wednesdays from 9:00-10:00 PM Eastern Standard Time.**
- In person office hours (drop-in/group)
Mondays in HHWE 311, 12:00 – 2:00 PM and in SSMB 140 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 your 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.
- This semester we will be doing some group discussion work online using discussion boards through OAKS. **As your instructor and facilitator I'll require you to make OAKS discussion posts about our course readings, as well as expecting you to thoughtfully reply to several of your peers' comments.** You can find a **rubric** about the expectations for quantity and quality of online discussion comments on OAKS.
- **Netiquette:** In our course discussions, we will be using complete sentences and proper grammar and will **not be using abbreviations or slang the way we do while texting on the cell phone.** Because it is difficult to interpret tone from only written text and our online communication in the OAKS discussion boards will lack facial expression, body language, hand gestures and other social clues, it is especially important that we all take special care to be sensitive to possible tone misinterpretation which can lead to inadvertently hurt feelings that result in isolation rather than inclusion. **We will all need to make sure that we are thoughtful, respectful, friendly, professional and considerate in our posts.** For example, when we are challenging each other's ideas, it is vital that we do not allow arguments to become personal. We can disagree about the subject matter in a respectful, intellectual way that still allows for us to work well and collaborate together.

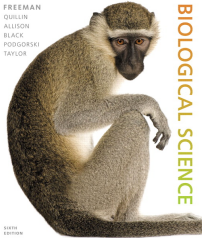
Expectations

- 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, discussion board posts, 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
- **#2 Pencil(s)** on exam days
- Basic **scientific calculator** (exponents & square roots)

Participation

- Students should post and reply to peers in the **online discussion board for each unit's reading or video. Please see rubric regarding posting guidelines and expectations.**
- There is no attendance requirement, but you will not do well if you do not attend class.

Late work

- Late discussion posts and peer replies lose 10% for each day late.
- Late quizzes are not permitted

Inclement weather

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

Accommodation

- SNAP 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 am fluent in Spanish. I understand that we all have way more important things going on in our lives than this biology class. I aim to be friendly, approachable, and understanding. But I will challenge you, and I will 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:

- Quizzes will be multiple-choice, individual, timed, randomized, approximately 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 will be in-class short answer/multiple choice exams.
- Discussion posts are made through OAKS and evaluated according to the rubric found in our course content on OAKS. Resources for locating and citing primary literature are also available on OAKS in the content area.

Grades calculated as follows:

<u>Component</u>	<u>Value (% of final course grade)</u>
Quizzes(7/8) lowest score dropped	25
Exams (3)	40 (10%, 15%, 15%)
Cumulative Final Exam	20
Discussions (3)	15
Total:	100%

Tentative Schedule for section 11 MWF class:

Week	Lecture topic	Chapter readings	Other Readings or Videos for Discussion	Due for grading	Suggested home work (not collected or graded)
1/11, 13	Intro, syllabus, Natural Selection	Review Chp 1		Syllabus quiz (1) (OAKS online) opens W 1/11 closes W 1/18 11:59 PM must earn 100% unlimited tries	Carefully read the syllabus
No class Monday 1/16 1/18, 20	Natural Selection and Evolution	22	<u>Article on OAKS:</u> Genetic manipulation: the first 50,000 years – for discussion 1 Read rubric carefully.	Discussion 1: Genetic modification – post by F 1/20 11:59PM. Two peer replies by M 1/23 11:59PM	Read the rubric before you do the discussion. Myth-busters: misconceptions about evolution (OAKS)
1/23-27	Evolution and Speciation	23		Quiz 2 (OAKS online) opens F 1/27 closes M 1/30 11:59 PM Average of up to three tries	Hardy Weinberg Equilibrium problems (OAKS)
1/30-2/3	Finish up evolution, exam 1, start plants	24.1-24.2, 34		Exam 1 W 2/1	Study for exam 1
2/6-10	Plant structure, function, transport	34, 35	<u>Video available through OAKS</u> – What Plants Talk About (NOVA) and Article (OAKS) Plants recognize kin – for discussion 2	Discussion 2: What plants talk about, kin recognition post by F 2/10 11:59PM. Two peer replies by M 2/13 11:59PM	Water potential problems (OAKS)
2/13-17	Plant nutrition and response	36, 37		Quiz 3 (OAKS online) opens F 2/17 9AM closes M 2/20 11:59 PM Average of up to three tries	Could you write a course description for a Plant Behavior class?
2/20-24	Plant reproduction	38		Quiz 4 (OAKS online) opens F 2/24 9AM closes M 2/27 11:59 PM Average of up to three tries	Draw and label a flower. Draw and label the cycle of alternation of generations.
2/27-3/3	Plant repro., develop. Exam 2	41		Exam 2 Friday 3/3	Study for exam 2
3/6-10 no class	<-----S P	R I N G	B R E A K -----	----->	
3/13-17	Intro to animal form and function, nutrition	39, 41	<u>Article on OAKS:</u> Just for fun – immortal jellyfish (EC on next exam)	Quiz 5 (OAKS online) opens F 3/17 closes M 3/20 11:59 PM Average of up to three tries	Draw and label human digestive tract. List enzymes produced in each area.
3/20-24	Animal gas exchange and circulation	42	<u>Article on OAKS:</u> Just for fun – how to hold your breath for 20 mins (EC on exam 3)	Quiz 6 (OAKS online) opens F 3/24 closes M 3/27 11:59 PM Average of up to three tries	Draw and label a mammal heart, show how blood moves. Compare and contrast arteries, veins, capillaries. Diagram how fish gills work.
3/27-31	Animal osmoregulation	40		Quiz 7 (OAKS online) opens F 3/31 9AM closes M 4/3 11:59 PM Average of up to three tries	Draw, label kidney nephron w/role of each segment. Label permeability to water/ions for each segment.

4/3-7	Animal nervous system and neuromuscular junction	43, 45	<u>Article on OAKS:</u> Just for fun – girl who feels no pain (EC on exam 3)	Quiz 8 (OAKS online) opens F 4/7 9AM closes M 4/10 11:59 PM Average of up to three tries	Describe how a toxin blocking the release of acetylcholine would affect you. A toxin blocking the closing of Na ⁺ channels
4/10-14	Animal reproduction	47	<u>Article on OAKS:</u> Evolution of the scrotum – for discussion 3 Birth control reliability NY Times (EC exam 3)	Discussion 3: The scrotum is nuts post by F 4/14 11:59PM. Two peer replies by M 4/17 11:59PM (please note Easter)	Understand what regulates menstruation monthly cycle. See birth control study, NY Times.
4/17-21	animal immunity and Exam 3	48	<u>Article on OAKS:</u> Just for fun – journey to science from an anti-vaxxer (EC exam 3)	Exam 3 Friday 4/21	
4/24 - 26 last day of classes is Wed 4/26	Animal sensory systems, review for final.	44		Course evaluations in class	
	CUMULATIVE	FINAL EXAM	FRIDAY	APRIL 28	8-11 AM

Addendum: 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 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**
 - ¹Understand 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 ²impact 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

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 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.

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