

# Biology 112: Evolution, Form and Function of Organisms

Section 2. TR 1:40-2:55 PM RITA 154

## Course Syllabus

Instructor Deb Bidwell

| RITA 229 | [bidwelld@cofc.edu](mailto:bidwelld@cofc.edu) | 843-953-7107 |

Spring 2020

## 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.

## Student Learning Objectives:

General:

- 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. (see addendum for more information)

Sustainability-Related:

- Students will be able to identify various elements of sustainability and relationships between them.

## 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](mailto: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**. This forum is designed to answer one another's questions speedily.
- My response turnaround time on the hallway conversations discussion board will be **within 24 hours weekdays and within 48 hours on weekends**, but often times students will answer one another's questions more quickly.

## *Office Hours*

- In person office hours (drop-in, group, no waiting) in **RITA 229 are Tuesdays 10AM-12PM and Fridays 11AM-1PM or by appointment** (arrange by email).

## *Course Communication and Community Building*

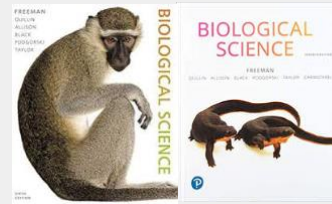
- **OAKS** will be utilized for **posting lectures, readings, quizzes, assignments, news, updates, and recording grades**.
- *New to Oaks?* Get up to speed fast with tutorials here: <http://blogs.cofc.edu/oaks/students/getting-started/>
- **Email** will be used to communicate important or sudden changes in course information.
- We will **all work together to build our classroom 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.

## **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 typically weekly obligations:** quizzes, written assignments, or exams.
- **Laptops or tablets are not allowed in class** unless a need for accommodation is documented. 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 our class time.

## Required Course Materials

- **Computer/technology** with access to **internet**
- **Software/Apps:** (OAKS, PowerPoint, Voicethread)
- **Textbook:** Freeman, Biological Science 6<sup>th</sup> or 7<sup>th</sup> edition
- **Pencil(s)** on exam days
- Basic **scientific calculator** (exponents & square roots)



## Participation

- There is no attendance requirement, but students who often miss class do not succeed.

## Accommodation

- **Center for Disability Services** (<http://disabilityservices.cofc.edu/for-faculty/faqs.php>)
- Any student eligible for and needing accommodations because of a disability is requested to speak with the professor during the first two weeks of class or as soon as the student has been approved for services so that reasonable accommodations can be arranged. This College abides by section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act. If you have a documented disability that may have some impact on your work in this class and for which you may require accommodations, please see an administrator at the Center of Disability Services/SNAP, 843.953.1431 so that such accommodation may be arranged.
- 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. I will also hold you to high standards.

## Honor Code and Academic Integrity:

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved. Incidents where the instructor determines the student's actions are related more to a misunderstanding will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed both by the instructor and the student, will be forwarded to the Dean of Students and placed in the student's file. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student's transcript for two years after which the student may petition for the XX to be expunged. The F is permanent. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration--working together without permission-- is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information via a cell phone or computer), copying from others' exams, fabricating data, and giving

unauthorized assistance. Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor. <http://deanofstudents.cofc.edu/honor-system/>

**Supplemental Instruction:** Our section has Supplemental Instruction with **Kahea Willm.** Supplemental Instruction is collaborative learning with a trained peer biology coach. It is for everyone, and is not remedial. Attendance is strongly encouraged! <http://csl.cofc.edu/supplemental-instruction/>

**Center for Student Learning:** I encourage you to utilize the Center for Student Learning's (CSL) academic support services for assistance in study strategies, speaking & writing strategies, and course content. They offer tutoring, Supplemental Instruction, study strategy appointments, and workshops. Students of all abilities have become more successful using these programs throughout their academic career and the services are available to you at no additional cost. For more information regarding these services please visit the CSL website at <http://csl.cofc.edu/> or call (843)953-5635.

## Assessment

- Weekly 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 prepare ahead of time, as quizzes are challenging and there will not be time to look up individual answers.
- Exams (3) will be in-class, short answer, and multiple-choice exams. Extra credit will be based on weekly readings. If you are truly too injured or ill to take an exam, you should be in the hospital or receiving urgent medical attention. If you need to miss an exam due to an official CofC activity, please make arrangements well ahead of time. Other valid excuses may be documented weddings or funerals. Documentation must be provided.
- Our written assignment will be assigned, collected, and graded through OAKS
- The final exam is cumulative, multiple choice, and held during the scheduled final exam time.

## Grades calculated as follows:

Component	Value (% of final course grade)
Quizzes (8/9) lowest score dropped, includes syllabus quiz	25
Exams (3)	45
Cumulative Final Exam	20
Sustainable agriculture written assignment	10
<b>Total:</b>	<b>100%</b>

<b>Final course average:</b>	<b>Grade</b>
100-93	A
90-92	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-
67-69	D+
63-66	D
60-62	D-
< 60	F

Tentative Schedule for Bidwell sp 2020 BIOL 112-02:

Week	Lecture topic	Chapter readings	Other Readings or Videos for Discussion	Due for grading	Suggested home work (not collected or graded)
Intro Jan. 9	Intro, syllabus, mingling	Review Chp 1	<a href="#">Article on OAKS</a> : Why I study duck genitalia	<b>Syllabus quiz 1</b> (OAKS online) opens 1/9 closes 1/16 must earn 100%	Carefully read the syllabus
1 Jan 14 & 16	Evolution by Natural Selection	22, 23	<a href="#">Article on OAKS</a> : The problem with theory	<b>Quiz 2</b> (OAKS online) opens 1/16 closes 1/21	Myth-busters: misconceptions about evolution (OAKS)
2 Jan 21 & 23	Evolutionary Processes and Speciation	24.1-24.3	<a href="#">Article on OAKS</a> : Genetic manipulation: the first 50,000 years	<b>Quiz 3</b> (OAKS online) opens 1/23 closes 1/28	Hardy Weinberg Equilibrium problems (OAKS)
3 Jan 28 and 30	Wrap up evolution unit, <b>Exam 1</b>			<b>Exam 1 is 1/30</b>	
4 Feb 4 & 6	Plant form and function	34.1-34.2	Article on OAKS Plants recognize kin	<b>Quiz 4</b> (OAKS online) opens 2/6 closes 2/11	Could you write a course description for a Plant Behavior class?
5 Feb 11 & 13	Plant growth and transport	34.3-34.4, 35	<b>ATTEND DARWIN WEEK EVENTS!</b>	<b>Quiz 5</b> (OAKS online) opens 2/13 closes 2/18	Water potential problems (OAKS)
6 Feb 18 & 20	Plant nutrition and response	36 and 37		<b>Sustainable Chocolate? Essay due 2/20</b>	
7 Feb 25 & 27	Plant reproduction and development	38		<b>Quiz 6</b> (OAKS online) opens 2/27 closes 3/3	Draw and label a flower. Draw and label the cycle of alternation of generations.
8 Mar 3 & 5	Conclude Plant unit and <b>Exam 2</b>			<b>Exam 2 is 3/5</b>	We will not cover everything in Chp 23. Draw and label human digestive tract. List enzymes produced in each area.
9 Mar 10 & 12	Intro to animals, nutrition, gas exchange	39, 41	<a href="#">Article on OAKS</a> : how to hold your breath for 20 mins		Draw and label a mammal heart showing flow. Compare and contrast arteries, veins, capillaries. Diagram fish gills.
10 Mar 17 & 19	<-----S P <b>R I N G</b>		<b>B R E A K</b> -----	----->	
11 Mar 23 & 26	Animal circulation, Animal osmoregulation	42, 40		<b>Quiz 7</b> (OAKS online) opens 3/26 closes 3/31	Draw, label kidney nephron w/role of each segment. Label permeability to water/salts/urea for each segment.
12 Mar 31 & Apr 2	Animal nervous system and neuromuscular junction	43, 45.1	<a href="#">Article on OAKS</a> : Girl who feels no pain	<b>Quiz 8</b> (OAKS online) opens 4/2 closes 4/7	Describe how a toxin blocking the release of acetylcholine would affect you. A toxin blocking the closing of Na <sup>+</sup> channels

13 Apr 7 & 9	Animal reproduction and development	47,21	<u>Article on OAKS:</u> Evolution of the scrotum	<b>Quiz 9</b> (OAKS online) opens 4/9 closes 4/14	Understand what regulates menstruation monthly cycle. See birth control study, NY Times.
14 Apr 14 & 16	Wrap up animal unit, and <b>Exam 3</b>		<u>Article on OAKS:</u> Birth control reliability	<b>Exam 3 is 4/16</b>	
15 Apr 21	Animal immunity <b>Last day of class is Tuesday 4/21</b>	48	<u>Article on OAKS:</u> journey to science from an anti-vaxxer		New material (immunity) will be on the final exam.
	<b>CUMULATIVE</b>	<b>FINAL EXAM</b>	<b>TUESDAY</b>	<b>APRIL 28</b>	<b>4-7 PM</b>

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**
  - <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.

<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.*

## **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.

**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