Biology 112-03
Evolution, Form, and Function of Organisms
Fall 2017

Lecture Time: MWF, 8:00-8:50 am, SSMB 138

Instructor: **Lauren H-R Senn**
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Office Hours: By appointment
Co-requisite: BIOL 112L
Textbook: *Biological Science, 6th Edition (Freeman)*

Course Objectives: This course is intended to be a foundation course for science majors, providing an introduction to basic principles of biology and emphasizing evolutionary processes, biodiversity, and plant and animal form & function.

Class attendance and participation: Students may miss up to 3 LECTURES (excused or unexcused).

- Students are expected to arrive to class on time and are expected to remain for the class duration. For every 2 instances that a student is tardy/leaves class early, a penalty of 1 unexcused absence will be assessed. **It is the responsibility of the student to make sure that they were counted on the class roll.**
- **Any UNexcused absences accrued thereafter will result in a final grade of WA (=F) for the course.**
- *Acceptable excuses* include illness, death of a family member or close friend, *pre-excused* CofC athletics event, religious holiday, military or jury duty. These must be appropriately **documented** through Student Affairs: http://studentaffairs.cofc.edu/about/absence-memo/index.php. I will **not** accept undocumented excuses.
- Students absent on an exam day must contact the instructor within 24 hours of the missed exam to schedule a make-up. **An excused absence must be documented through Student Affairs to make up an exam. Make-ups are not permitted after exams have been handed back.**
  Students are responsible for any missed material, whether the absence be excused or unexcused.

Online Course Materials: Readings, exams dates, and grades will be available online through OAKS. You can access OAKS via MyCharleston (http://my.cofc.edu). Readings are to have been read **before** coming to class on that day.

Classroom Conduct:

- No laptops!
- Cell phones should be on 'silent' and put away. Text messaging during class time is not permitted. The instructor reserves the right to dismiss students who violate the cell phone policy (which counts as an unexcused absence). Note: the use of your cell phone during a test is considered cheating and will result in a zero.
- Students should refrain from carrying on private conversations during class.

Honor System: All students are expected to abide by the College of Charleston Honor System. The Honor System text may be viewed on the Student Affairs web site: http://studentaffairs.cofc.edu/honor-system/index.php. Violation of the Honor Code may result in a final grade of XF for all parties involved. I will require you to sign an honor pledge on each assignment that you turn in. This is a short statement, signed and dated, to express your commitment to College of Charleston's Honor System. An example of an honor pledge is below:

"I pledge that I have neither received nor given unauthorized assistance during the completion of this work and that the work I am submitting is of my own ideas and the work of others will be properly cited"
_____ *Signature* _____ *Date*

Accommodation: Students needing special accommodations to complete the requirements for this course should contact me as soon as possible.

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 skills, and course content. They offer tutoring, Supplemental Instruction, study skills 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

Lecture Exams: There will be 3 exams and a cumulative final on the lecture content. **AN EXCUSED ABSENCE MUST BE DOCUMENTED THROUGH STUDENT AFFAIRS TO MAKE UP AN EXAM.**

***Grading (subject to change)**

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

Grades	% of grade
Lecture Exams 1-3	75
Final Exam (cumulative)	25
TOTAL	100%

Tentative Sequence of Lecture Topics

LECTURE TOPICS	Chapter(s)
Evolutionary Processes and Origins of Life	22-24
Plant Development, Nutrient Transport, and Reproduction	28; 34-38
Animal Development	21; 30-32
Animal Tissues and Organ Systems	39
Animal Circulatory and Respiratory Systems	42

Important Dates

Date	Event(s)
Tues. Aug 22nd	Classes begin
Mon. Aug 28th	112 Labs begin
Fri. Sept. 15th	EXAM 1
Wed. Oct. 11th	EXAM 2
Oct. 16-17	Fall Break
Wed. Nov. 15th	EXAM 3
Nov. 22-26	Thanksgiving Break
Wed. Dec. 6th	FINAL EXAM (12:00-3:00 pm)

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 transformation 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).
Biological 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:

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- 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

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- 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 outcome of the testing of hypotheses and theories that 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 the real world as defined by the laws of chemistry and physics.
- Understand the differences between and relations among a scientific theory, hypothesis, fact, law, & opinion.
- 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 understand 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.

Developing 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.

Developing 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…); finding and evaluating the validity of science-related information.
- Communicate scientific knowledge, arguments, ideas in a variety of different contexts (scientific, social, cultural) and 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.

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

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

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