

Concepts and Application in Biology I

BIO 101 section 02

Spring 2016

4 Semester Hours

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Class Room: SSMB 138

Meeting times: Lecture: MWF 2-2:50 PM

Office Hours: MWF 3-3:30 PM and by appointment

Text: Biology: Concepts and Applications by C. Starr et al. 9th ed.

ISBN: 978-1285427812

Lab manual must be purchased before the first lab

Description:

This is a non-science majors' course, which will provide a background for understanding and evaluating contemporary topics in biology and societal/environmental issues. The course emphasizes cellular and molecular concepts, including biochemistry, cell structure and function, respiration, photosynthesis, genetics and molecular biology. An understanding of methods, history, and dynamic nature of science will also be emphasized.

Attendance:

It is critical that students attend lecture and laboratory in order to grasp the concepts and gain the necessary experience required for achievement in science courses. You are therefore expected to attend all lectures and laboratories for this course and are expected to arrive on time. I have found that students that miss my class regularly do poorly on the exams. You will be dropped from the course if you accumulate absences of more than 20% of the class periods (**6 class periods**). This means you can miss a total of 6 class periods, but no more. Be sure to sign the attendance sheet each meeting!

- Excused absences must be appropriately documented through student affairs:
<http://studentaffairs.cofc.edu/about/absence-memo/index.php>

If you fail to attend class or lab, it is your responsibility to:

- Check with the instructor for material covered, assignments, and announcements.
- Obtain notes from a classmate.
- Make arrangements to have any assignments due the day you missed turned in on time. Your absence from the class is not an excuse for late material.

Lab Attendance: Your attendance in lab is required. If you do not attend lab as required, you will be removed from both the lab and lecture. **Please contact you TA as soon as you know that you miss a lab.**

Tentative Grading Structure:

Exams (4 exams)	40%
Final Comprehensive exam	20%
Essay	15%
Laboratory Grade	25%

Exams:

Lecture exams will consist of multiple choice, true/false, matching, and short answer style questions. Students will be responsible for any information discussed in class, readings, and any board drawings, graphs and/or diagrams discussed in lecture. Bold terms from the textbook, that we have discussed, will also be included on exams. Make-up exams are only given for documented excused absences.

Essay (due April 15, 2016):

Select an environmental topic and write a three-page double-spaced paper (three pages does not include the cover or reference page) on how you, as an individual, or we, as a college, city, country, and/or world, can make positive changes to the environmental damage. You are required to use three peer-reviewed sources for the paper (properly referenced). Some topics that are possible include, although other topics are possible and welcome,

- Invasive species: choose an invasive species, discuss how the species was spread and the damage that it is causing (economic and environmental cost) and discuss how the spread of this organism can be eliminated or reduced.
- What difference does using a refillable water bottle make on the environment compared to using disposable water bottles? You may discuss the environmental impact of the disposable bottles in the landfill and of obtaining the resources to make them initially.
- Does going paperless really help the environment?
- Does mass transit or carpooling make a positive effect on the environment? How extensive is the effect that it has compared to individual vehicles?
- Do community gardens benefit the environment in any way or are the benefits only sociological?
- What are the full effects of deforestation on the environment and what can we do to stop deforestation?
- Does/did the endangered species act help reduce species decline or should we move to preserving full ecosystems rather than specific species?
- Is hunting helping or hurting the environment?
- What is green energy? Should nations force their populations to use/switch to green energy or give subsidies/tax cuts for their use?

Cheating & plagiarism:

Students are reminded to review and abide by the College of Charleston Honor System (<http://studentaffairs.cofc.edu/honor-system/index.php>). Any student found to be in violation of any part of the Honor Code, may receive a final grade of F in the course and may also be reported to the Honor Board. The first offense will result in a zero for that particular assignment, exam, etc. A second offense will result in a report to the Honor Board and an "F" in the class. If more than one person is involved in cheating, all parties involved will receive the same consequences. If you suspect another student of cheating or plagiarism, it is your responsibility to inform the instructor immediately.

- **Note:** Having a friend sign your name on an attendance sheet on a day you are absent is considered academic dishonesty.

Cell phones:

Please be sure to silence your cell phone ring tone before coming to class. Students are not permitted to use the calculator function of their cell phone during exams. **If I see a cell phone in your hand or see you in any way interacting with a cell phone during an exam, I can only assume you are cheating and I will act accordingly.**

Students with disabilities:

The college will make reasonable accommodations for persons with documented disabilities. Students should apply at the center for Disability Services/SNAP, located on the first floor of the Lightsey center, Suite 104. Students approved for accommodations are responsible for notifying me as soon as possible.

Tentative Semester Lecture Schedule:

<u>Dates</u>	<u>Chapters</u>	<u>Reading</u>
01/08	Introduction	
01/11-01/15	The scientific method	Chapter 1
	Life's Chemical Basis	Chapter 2
01/18	No Class – MLK (college is closed)	
01/20-01/22	Molecules of Life	Chapter 3
01/25-01/27	Cell Structure	Chapter 4
01/29	Exam one: Chapter 1-4	
02/01-02/05	Energy	Chapter 5
02/08-02/12	Photosynthesis	Chapter 6
02/15-02/17	Cellular Respiration	Chapter 7
02/19	Exam 2: Chapters 5-7	
02/22-02/26	DNA structure and function	Chapter 8
02/29-03/04	From DNA to Protein	Chapter 9
03/07-03/11	No Class – Spring Break	
03/14-03/16	Control of Gene Expression	Chapter 10
03/18	Exam 3: Chapter 8-10	
03/21-03/25	Mitosis and Meiosis	Chapter 11-12
03/28-04/01	Mitosis and Meiosis	Chapter 11-12
	Genetics	Chapter 13
04/04-04/06	Genetics	Chapter 13
04/08	Exam 4: Chapter 11-13	
04/11-04/15	Genetics and Inheritance	Chapter 14
04/15	Essay Due	
04/18-04/20	Biotechnology (if time allows)	Chapter 15
04/22	Reading Day	
04/25 (4 PM)	Final Exam (comprehensive)	

Note:

- The Final Exam will be held on **Monday (April 25, 2016) at 4 PM** per the University final exam schedule.
- This schedule is tentative. As the instructor, I reserve the right to modify this schedule and/or material covered as I see fit at any time during the semester.
- The chapters listed in the course schedule are not suggestions! They are assignments. You should read the appropriate chapter prior to class in order to get the most out of each lecture. Students should be able to judge what to read prior to the next lecture based on progress in lecture to date.
- Students miss class and skip reading assignments at their own risk!

Grading Scale:

A 93-100	C 73-76
A- 90-92	C- 70-72
B+ 87-89	D+ 67-69
B 83-86	D 63-68
B- 80-82	D- 60-62
C+ 77-79	F <60

CONCEPTS AND APPLICATIONS IN BIOLOGY I & II

BIOL 101 & 101L/BIOL102 & 102L

Department: Biology

Learning Goals & Objectives

This general education science course provides a background for understanding and evaluating contemporary topics in biology and societal/environmental issues. Students develop a general understanding of core concepts and 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 which broadly include:

- **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.

These ideas are explored from the perspective of the following topics in each course:

BIOL 101 & 101L

- Chemical and Physical Properties of Life
- Evolution as a unifying principle in biology
- Cell Form & Function
- Energetics and Metabolism
- The Cell Cycle
 - Meiosis and Sexual Reproduction
 - Mitosis and Cell Reproduction
- Mendelian Genetics

- Patterns of Inherited Traits
- Human Inheritance
- The Molecular Basis of Inheritance
- DNA and protein production
- Regulation of gene expression
- Biotechnology

BIOL 102 & 102 L

- Evolutionary Processes
- Origins of Life
- Biodiversity
 - Viruses, Bacteria and Archaeans
 - “Protist” Lineages
 - Plants
 - Fungi
 - Animals
- Plant Form & Function
- Animal Form & Function
- Principles of Ecology

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**
 - ¹Understand 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 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

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 102 lab as part of the multi-week student-directed independent research project. In this project students use ecological data they collect (or which has been collected in actual research investigations) to test an ecological hypothesis of their choosing. This multi-week project begins with students becoming experts in various areas of ecological sampling. Students, working in small research teams, decide on a question they would like to explore. Teams then develop a research proposal to test their hypothesis. Students collect (or use already collected data), summarize and analyze the data, and draw conclusions.

Learning Outcome #2-Students demonstrate an understanding of the impact that science has on society.

BIOL 102 lab students produce a written document (examples-policy statement, article, stake-holder professional letter or poster) which 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 epidemic of diabetes in the United States
- solutions for mitigating global climate change

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.