Biology 111: Introduction to Cell and Molecular Biology
Fall 2016 Syllabus

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Office: 65 Coming St. Room 213 (right at the top of the stairs). However, I will not be in my office as often this semester because I will only be teaching at Harbor Walk. You may be able to find me in one of the faculty offices in Harbor Walk West for those of us who have offices far away--HWWE 309 or 311.
Office Hours: I do not set office hours. Rather, so that I may accommodate all students' schedules, I ask that you send me an email with your schedule so that I may look at my schedule and come up with a time (and a place) that will work for both of us.
Required Text: *Biological Science*, 6th ed., by Scott Freeman
Also Required: i>clicker (any type), but you may not use the phone app

Course Description: A foundation course for science majors emphasizing the concepts of structure and function in biological systems at the molecular and cellular levels. Topics include biochemistry, biochemical, and molecular evolution, cell function, respiration, photosynthesis, genetics, and molecular biology.

Learning Outcomes: Upon completing this course, students will demonstrate basic knowledge and understanding in each of the following content areas as is covered in class, as well as demonstrate the ability to apply this knowledge to real-life situations:

- The 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

Course format: This course will be using a "flipped" course format. You will be watching your lectures at home online, and we will strictly be doing learning activities and having educated discussions in class. This requires a lot of discipline on your part to ensure you keep up with the lectures and reading. However, it also offers you the ability to watch the lectures at your own pace and rewind as needed. The course lectures are typically broken down into shorter segments than a typical class, so you will often have to watch several of the lectures before each class. You should be prepared for an i>clicker quiz on the lecture material at the beginning of each class. Lectures that are due for the next class are posted on the Daily Course Schedule which you can access through OAKS. You should check this daily; the entire semester is planned ahead, but things can and often do change.

My reason for using this format is to benefit you. You will learn a lot of information in this class! It can be difficult to retain it all, but even more difficult to understand it. It will not do you any good to just memorize this information; you must be able understand and apply it. That can be very tough to do on your own. However, there is so much material to "cover" that there is not typically enough time to lecture and do additional activities that help you to understand. Instead, you end up doing those activities at home where there is no one to help you get through it. By "flipping" the classroom, you will have the support of a classroom group and of me to help build your understanding.

Attendance: Your grade in this course relies heavily on your participation in class. Excessive absences are guaranteed to affect your grade. Attendance will not be taken; however, **no make-ups** will be allowed for missed assignments or quizzes. If you are late to class and miss the quiz, you will not be allowed to take it. Therefore, regular attendance is highly recommended. It is the student's responsibility to find out what was missed in case of unavoidable absence. If you must miss a class due to illness, you may be allowed to complete the missed work or an alternate assignment, but you must obtain an absence memo from the Office of the Associate Dean of Students at 67 George Street. It must be a **documented** absence to be excused, and you must talk to me about it. I do not look at my absence memos at all unless you speak to me. You may access the required forms at the following address: http://studentaffairs.cofc.edu/services/absence.php

Inclement weather: In the case that class is canceled due to inclement weather or for any other reason, it is your responsibility to check the news feed on OAKS and the daily course schedule to know what is expected of you by the next class.

Tests: There will be three tests over the course of the semester. All will be offered in OAKS, and you will be given a specific timeframe in which you must have the test completed. Tests will open at noon on the first day of testing and will close at 9 PM on the last day of testing. The cumulative final exam will be given in paper format in the classroom.

Missed tests or assignments: There will be **no make-ups** given for in-class assignments or tests. Students with extenuating circumstances must contact me **in advance** of the class or test that must be missed to discuss their options.

Accommodations for 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 and for contacting me at least one week before any accommodation is needed.

Extra help: The Center for Student Learning (CSL) now has a walk-in science tutoring lab. You may use the walk-in lab during the scheduled times of operation which can be found at http://csl.cofc.edu/labs/. You will also have a Supplemental Instruction (SI) leader for this class. There will be three SI sessions per week that are associated with only with this particular lecture section. Your SI leader will attend all classes. I encourage you to go to SI sessions early, often (weekly), and regularly (not just right before an exam). However, if you still need additional assistance with concepts that you are having difficulty with, the science lab is a nice option.

Academic dishonesty: Guidelines for this course will follow the College of Charleston Undergraduate Catalog policies for Academic Integrity and the Honor Code, Student Code of Conduct, and Classroom Code of Conduct.

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.

Students should be aware that unauthorized collaboration—working together without permission—is a form of cheating; this includes collaborating with classmates or other individuals on online tests. 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.

I also consider bringing a fellow student's i>clicker to class to be cheating and a violation of the Honor Code. If you are caught with a remote other than your own or have votes in a class that you did not attend, you will forfeit all i>clicker points and may face additional disciplinary action.

Students can find the complete Honor Code and all related processes in the *Student Handbook* at:
http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php

OAKS: OAKS is the learning management system that is used by the College of Charleston. It is imperative that you learn to use OAKS, as it will be used by many of your classes as a way to provide material, gives quizzes or tests, as a way to collect assignments, as a way to have class discussions, and as a way to communicate grades. I will be using OAKS extensively for this course, and will keep a running grade average for you on OAKS. You can log in to OAKS through MyCharleston, and there are many tutorials if you have trouble familiarizing yourself on your own. Here is a link to the OAKS support page, which is an excellent resource and links out to all of the tutorials: http://blogs.cofc.edu/oaks/students/getting-started/.

Online discussion: Because of the "flipped" format of this course, there will also be an online discussion board so that you can ask questions as you work through the material called the Course Lounge. This is where you should post any questions or comments from which the whole class could benefit from either the question or the response. I encourage all of you to answer one another's questions, and I will step in if something is incorrect. You should all subscribe to this discussion board so that you are notified when someone posts. Hopefully, we can generate some good, helpful discussion online. And this is definitely a place to go to look for answers before you ask a question as well. Also, from time to time, I may require you to do a discussion post on a separate discussion board regarding specific course material.

Mastering Biology: You should also have received an access code along with your textbook for the Mastering Biology website that accompanies your textbook: www.masteringbio.com. This is an excellent resource when studying. On this website, each chapter is broken down with key terms, web activities for difficult concepts, etc. You can take practice tests on the chapters, and you can even create your own cumulative tests to cover several chapters. While these quizzes will not be as application-based as the tests, they will help you to find gaps in your knowledge as you study. I highly recommend you make use of this resource. If you did not buy a new book, you may buy an access code independently if you choose, but it is not required.

Community engagement and extra credit: It is important that as good citizens you engage yourself in the local community. Because of this, I offer extra credit opportunities that encourage good citizenship and community engagement. I will discuss these options with you in class. These will be the only opportunities for extra credit. Please do not ask me for any other extra credit.

Grading:

Grade Scale	Final Grade Computation
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 0 – 59 %	In-class and occasional out-of class assignments will constitute 15% of the final grade. i>clicker quizzes will count 10%. The three tests will count ~16.67% each (50% total). The final exam will count 25%. The instructor reserves the right to adjust the final grade based on lack of participation in group activities.

Weekly Schedule and Relevant Readings (schedule is subject to change):

Week	Date	Topic	Relevant Chapters
1	**8-23**	Intro to course; Biology and the Tree of Life	1
	8-25	Water and Carbon: the Chemical Basis of Life	2
	8-30		
	9-1	Macromolecules	3-6
3	**9-6**		
	9-8		
4	**9-13**	***NO CLASS--Test I available on OAKS from Sun,, Sept. 11th, at noon until Tues., Sept. 13th, at 9 PM***	1-6.1
	9-15	Inside the Cell	7
5	**9-20**	Inside the Cell	7
	9-22		
6	**9-27**	Energy and Enzymes	8
	9-29	Cellular Respiration and Fermentation	9
7	**10-4**		
	10-6	Photosynthesis	10
8	**10-11**	Photosynthesis	
	10-13	Cell-Cell Interactions	11
9	**10-18**	TBD	
	10-20	***NO CLASS--Test II available on OAKS from Thurs., Oct. 20th, at noon until Sat., Oct. 22nd, at 9 PM***	6-11
10	**10-25**	The Cell Cycle and Meiosis and Stem Cells	12-13, see OAKS for stem cells
	10-27		
11	**11-1**	Genetics	14
	11-3		
12	**11-8**	*NO CLASS--Fall Break*	
	11-10	DNA and the Gene: Synthesis and Repair	15
13	**11-15**	How Genes Work	16
	11-17	Transcription, RNA processing, and Translation	17
14	**11-22**	***NO CLASS--Test III available on OAKS from Sun., Nov. 20th, at noon until Tues., Nov.. 22nd, at 9 PM***	12-17 and stem cells
	11-24	*NO CLASS--Thanksgiving Break*	
15	**11-29**	Control of Gene Expression	18-19
	12-1	TBD	

The final exam will be in given, in paper format, on Tues., Dec. 13th from 12 PM until 3 PM, in the lecture classroom and will cover all material previously covered in the course.

General Education 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:

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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 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.

<u>Signature assignments for measuring learning outcomes</u>

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 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.*