Biology 111: Introduction to Cell and Molecular Biology

Section 1 MWF 10:00-11:50 PM RHSC 101

Course Syllabus

Instructor Deb Bidwell

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Fall 2018

Course Description:

- Introduction to Cell and Molecular Biology is a foundation course for science majors emphasizing critical thinking skills, and the concepts of structure, and function in biological systems at the molecular, and cellular levels. Topics include the scientific process, biochemistry, molecular biology, cell structure and function, respiration, photosynthesis, and genetics. Completion of this class and the associated laboratory meets a General Education requirement, detailed at the end of this syllabus.

Pre-requisites

- None. Biology 111 Laboratory is a co-requisite, unless students already have credit for the laboratory portion of the course.

Student Learning Outcomes:

- This general education science sequence provides a background for understanding and evaluating contemporary topics in biology. Students develop a foundational understanding of core biology 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 further details.

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 normally 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 OAKS **Discussion Board "Hallway Conversations" open 24 hours a day, 7 days a week.**
- My response turnaround time on the hallway conversations discussion board will normally be **within 24 hours weekdays and within 48 hours on weekends.**

Office Hours

- In person office hours (group drop-in) **RHSC 229 Mondays 3-5 PM, Thursdays 10-12 AM. Individual meetings by appointment** may be arranged by email**.**
- Online office hours/tutoring may be arranged by email.

Course Communication and Community Building

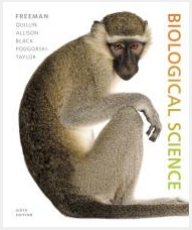
- **OAKS** will be utilized for **content, quizzes, news, updates, and online office hours.** *New to Oaks?* tutorials here: **http://blogs.cofc.edu/oaks/students/getting-started/**
- **Email and OAKS news** will be used to communicate important or sudden changes in course information.
- We will **all 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 diverse community of learners.
- This semester we will be doing some group discussion work online using written discussion boards through OAKS. Students will **write about our course readings, and make thoughtful replies to peers.** You can find a **rubric** about the expectations for quantity and quality of online discussion comments on OAKS.
- **Netiquette:** In our written course discussions, we will be using complete sentences and proper grammar and will **not be using abbreviations or slang the way we might while texting.** 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 care to be sensitive to possible tone misinterpretation which can inadvertently lead to exclusion rather than inclusion. **We will all need to make sure that we are respectful, and professional 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 must earn **100% on online OAKS syllabus quiz** to access course materials**.**
- Students should plan to **log into Oaks at least 3 times per week.**
- Students should dedicate **6+ hours per week** outside of class 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 often weekly obligations**: quizzes, discussion board posts, or exams.

- **Procrastination hurts - the course builds and snowballs**.
- **Ask for help early and often**. Don't wait until you feel overwhelmed.

Required Course Materials



- **Computer/technology** with access to **internet**
- **Software/Apps**: (OAKS, PowerPoint)
- **Textbook**: Freeman, Biological Science 6th edition
- Basic **scientific calculator** (logs, exponents, & square roots)

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 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://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php

Supplemental Instruction:

Our section has Supplemental Instruction. Supplemental Instruction is collaborative learning with a trained peer biology coach. It is for everyone, and is not remedial. Attendance is not required but strongly encouraged! Students attending SI more than five times during the semester will receive a 0.5% bonus on their final course grade, which may be enough to raise a grade when the course average is borderline. 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

- Unit 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 medical attention. If you need to miss an exam due to an official CofC activity, please make arrangements well ahead of time. Documentation must be provided through the Dean of Students office at 67 George Street. SNAP students need to bring appointment envelopes with several days notice.
- Discussion posts (3) will be made through the OAKS discussion board in small groups, and evaluated according to the rubric found on OAKS in course content.

Grades calculated as follows:

Component	Value (% of final course grade)
Quizzes - lowest score dropped (7)	**25**
Exams (3)	**40**
Cumulative Final Exam	**20**
Written Discussions (2)	**15**
Total:	**100%**

Tentative Schedule for Bidwell section 1 MWF 10 AM BIOL 111 f2018 class:

Week	**Lecture topic**	**Chapter readings**	**Discussion Readings/Videos**	**Due for grading**	**Suggested home work** (not collected or graded)
Aug 22-24 **Labs start F 8/24**	Course Intro. Deep patterns in life. How does science work?	1 and Big Picture on p 16-17 Bioskills 18 (p 53-54)	Article on OAKS: Tardigrades – for class	**Must score 100% on syllabus quiz (OAKS online) by 8/31**	Be curious, play outside, meet people in class. Answer blue questions in text
Aug 27- 31 **All labs meet**	Scientific literacy, biology's tenets, the cell, diffusion & osmosis	1, 7.3, 6.3 The Big Picture p16-17 Bioskills 13 & 14	Article on OAKS: The trouble with "theory" – for class	**Quiz 1** (OAKS online) opens Friday 8/31 closes Monday 9/3 at 11:59 PM, average of up to three tries.	Sponge Bob Science activity Answer blue questions in text
Sept 3-7 **yep, we have class on Labor Day**	Scale Atoms Bonds Chemical reactions	2	Article on OAKS: "Shrimp on treadmills"… for OAKS discussion board **graded writing assignment.** Read directions and rubric.	**Discussion Board Post #1 "**thread" to OAKS by F 9/7 & **2 peer replies** by M 9/10 11:59 PM	What is a covalent bond? Explain polarity.
Sept 10-14 **class goes exponential**	Water pH carbon skeletons functional groups proteins	2 3 The Big Picture p 140-141	Article on OAKS: The mystery of earth's oxygen – for class	**Quiz 2** (OAKS online) opens Friday 9/14 closes Monday 9/17 at 11:59 PM, average of up to three tries.	-pH practice problems -chemical doodling -answer blue questions in text
Sept 17-21 **Hold onto your hats. You are going to SI, right?**	Nucleic acids Carbohydrates Lipids	4 5 6 The Big Picture p 140-141	Article on OAKS: Paleo carb diet – for class	**Quiz 3** (OAKS online) opens Friday 9/21 closes Monday 9/24 at 11:59 PM, average of up to three tries.	Answer blue questions in text
Sept 24-28 **Exam 1 on F 9/28**	Membranes, connections, interactions Energy, enzymes	6 7.4, 7.5 11 8 Big Picture p 140-141			Prep for exam 1
Oct 1-5	Light, Photosynthesis	10 The Big Picture pp 232-233	Article on OAKS: Could biomimicry revolutionize renewable energy?	**Quiz 4** (OAKS online) opens Friday 10/5 closes Monday 10/8 at 11:59 PM average of up to three tries.	Answer blue questions in text Finalize and correct concept map for study.
Oct 8-12 (Express II classes start 10/10)	Cellular Respiration	9 The Big Picture pp 198-199	Article on OAKS: Missing link in the evolution of complex cells – for class	**Quiz 5** (OAKS online) opens Friday 10/12 closes Monday 10/15 average of up to three tries.	Answer blue questions in text

Oct 15-19 **Exam 2 on F 10/19**	Fermentation Finish up	12 15 The Big Picture 396-397			Prep for exam 2
Oct 22-26 (withdraw deadline is 10/24)	(F) Cell cycle DNA synthesis Mitosis	12 15 The Big Picture 396-397	Article on OAKS: Henrietta Lacks – for OAKS discussion board **graded writing assignment.** Read directions and rubric.	**Discussion Board Post #2 "**thread" to OAKS by F 10/26 & **2 peer replies** by M 10/29 11:59 PM	Compare and contrast mitosis and meiosis. Draw out all stages.
Oct 29-Nov 2	Meiosis Genetics	13 14 Bioskill 5 Big Picture 396-397	Articles on OAKS: Race, the power of an illusion and How evolution has shaped elite sports – for class		Draw out meiosis Genetics problems #1 Answer blue questions in text
Nov 5-9 **VOTE!** **No class M, Fall Break.**	Genetics continued The genetic code	14 16 Big Picture 396-397	Article on OAKS: How simple can life get? – for class	**Quiz 6** (OAKS online) opens Friday 11/9 closes Monday 11/12 average of up to three tries.	Genetics problems #2 Answer blue questions in text
Nov 12-16 **Exam 3 F 11/16**	Transcription & Translation	17 Big Picture 396-397		**Exam 3 on 11/16**	Prep for exam 3
Nov 19-23 **Online lecture Monday. No classes Wed. and Fri. for Thanksgiving**	Control of gene expression intro	18.1			Give thanks and get full. Adopt a friend who won't be heading home. Develop study plan for all final exams
Nov 26-30	Control of gene expression cont. Epigenetics Intro to Biotech	18 19 20(skim)	Article on OAKS: Epigenetics, why fathers matter, for class	**Quiz 7** OAKS online) opens Friday 11/30 closes Monday 12/3 average of up to three tries.	Prep for final exam
Dec 3	Wrap it up, course evaluations	Review all Big Pictures thru Chp 19	**(LAST DAY**	**OF CLASS IS ON**	**MONDAY 12/3)** Optional EC final exam study packet.
	CUMULATIVE	**FINAL**	**MONDAY**	**DEC 10th**	**8-11 AM**

Addendum:
General Education Learning Outcomes

Introduction to Cell and Molecular Biology/Evolution, Form, and Function of Organisms
BIOL 111 & 111L/BIOL 112 & 112L Department: Biology

Learning Outcomes:
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:

<u>Biology 111 & Biology 111L</u>

- 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**
  - [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.

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[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.*

    - 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.

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.

[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.*