

## **Biology 111: Introduction to Cell and Molecular Biology--section 11 Fall 2020 Syllabus**

**Instructor:** Miranda McManus

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**Office:** 65 Coming St. Room 213 (right at the top of the stairs).

**Office Hours:** I will likely not be in my office much this semester. Reach out to me to schedule a time to meet over Zoom.

**Class Meeting Times and Place:** Tuesdays and/or Thursdays 1:40 PM - 2:55 PM as scheduled on OAKS either on Zoom or in RITA 154. Details for each week will be posted on OAKS

**Required Text:** *Biology*, 2<sup>nd</sup> ed., by OpenStax--this is freely available here:

<https://openstax.org/details/books/biology-2e>

You can also download a free pdf version of the textbook, or access the text via the OpenStax app for free. If you prefer to have a printed textbook, you may purchase or rent a printed version at the bookstore or through other means.

**Required materials:** All students must have access to a computer equipped with a web camera, microphone, and Internet access. Resources are available to provide students with these essential tools.

**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. BIOL 111L is a required co-requisite lab.

**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 in a primarily online format. You will be watching your lectures online asynchronously, and those lectures will be followed by a quiz as well as active learning and discussion-based activities that you can do on your own time by a given due date. 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. Each week I will post a checklist for the week with due dates for the quizzes and assignments and a recommended timeline for completing the lectures. We will plan to meet at least once a week on Zoom, and will hopefully have some in-person meetings as the semester progresses during our class time. Any in-person meetings will be significantly limited in capacity to allow for proper distancing. The Zoom meeting schedule and links as well as the schedule of any in-person meetings will be included in the weekly checklists.

**Science Literacy:** In this course, my goal is not only to help you learn the basics of biology, but it is also to help you increase your level of scientific literacy. It is important to understand how science works and what it contributes to our society, and it is crucial that all of us understand how to discern credible sources of information. So throughout this course, we will also spend some time learning what it means to be scientifically literate, and you will have an opportunity to apply some of these concepts through assignments.

**Recording of Classes:** Class Zoom meetings will be recorded via both voice and video recording. By attending and remaining in this class, you consent to being recorded. Recorded class sessions are for instructional use only and may not be shared with anyone who is not enrolled in the class.

**Inclement weather or other substantial interruption in instruction:** In the case that class procedure needs to be modified due to inclement weather or for any other reason, it is your responsibility, as always, to check the news feed on OAKS to know what is expected of you and/or how the course will be modified to accommodate. Realize that the news feed may not be updated immediately. Please understand it will take time for me to figure out how I am going to adjust the schedule to accommodate the change.

**Attendance:** Your grade in this course relies heavily on your participation in class. A lack of engagement is guaranteed to affect your grade. Attendance will not be taken for any class meetings, online or in-person; however, class meetings will always be an opportunity for you to ask questions. And even if you don't have a question, the discussion should be beneficial and the questions of others can help you form your own--or at least help you realize some holes in your understanding. Therefore, regular attendance at class meetings is highly recommended.

You are, however, required to engage with the course regularly in OAKS. If you become ill or experience some sort of hardship that affects your ability to engage with the class, you must let me know immediately. Do not wait to contact me until after you miss assignments. If you miss work, I may ask you to obtain an absence memo from the Office of the Associate Dean of Students. If required, it must be a **documented** "absence" to be excused; you must talk to me about it, and it is at my discretion. You may access the required forms at the following address: <http://studentaffairs.cofc.edu/services/absence.php>. Again, it is your responsibility to contact me immediately with any issues.

**Tests:** There will be three tests over the course of the semester. All will be offered in OAKS, and you will be given a three-day timeframe in which you must have the test completed. There will be a cumulative final exam given during the exam period for this course. ***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.***

**Missed tests or assignments:** There will be **no make-ups** given for tests. You already have three days during which you may take each test (except the final exam). Students with extenuating circumstances must contact me in advance of the class or test that will be missed to discuss their options. Assignments should be turned in by the day they are due. You may receive partial credit if you submit a late assignment, but that depends on the assignment and on how late it is. The credit you receive for late assignments is solely at my discretion.

**Accommodations for students with disabilities:** The College will make reasonable accommodations for persons with documented disabilities. Students should apply with the Center for Disability Services/SNAP (<http://disabilityservices.cofc.edu/>). 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.

**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.

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 the way that I provide material, give quizzes and tests, collect assignments, facilitate class discussions, and communicate grades. You can log in to OAKS through MyCharleston; however I use the direct link <http://lms.cofc.edu> because it is nearly always functional, while MyCharleston can occasionally go down or slow down with traffic. 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:** There will be an online discussion board so that you can ask questions as you work through the material in this course 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.

**Food and housing insecurity:** Many CofC students report experiencing food and housing insecurity. If you are having difficulty affording groceries or accessing sufficient food to eat every day, or if you do not have a safe and stable place to live, please contact the Dean of Students for support (<http://studentaffairs.cofc.edu/about/salt.php>). You can also go to <http://studentaffairs.cofc.edu/student-food-housing-insecurity/index.php> to learn about food and housing assistance that is available to you. In addition, you can visit the Cougar Pantry in the Stern Center (2nd floor), a student-run food pantry that provides dry-goods and hygiene products at no charge to any student in need. There are also many resources off-campus. The Dean of Students can help connect you with these resources. Furthermore, please notify me if you are comfortable in doing so. This will enable me to provide connections to any resources of which I may be aware and help me to understand the challenges you are facing as a student.

**Mental & Physical Wellbeing:** At the college, we take every students' mental and physical wellbeing seriously. If you find yourself experiencing physical illnesses, please reach out to student health services (843.953.5520). And if you find yourself experiencing any mental health challenges (for example, anxiety, depression, stressful life events, sleep deprivation, and/or loneliness/homesickness) please consider contacting either the Counseling Center (professional counselors at <http://counseling.cofc.edu> or 843.953.5640 3<sup>rd</sup> Robert Scott Small Building) or the Students 4 Support (certified volunteers through texting "4support" to 839863, visit <http://counseling.cofc.edu/cct/index.php>, or meet with them in person 3<sup>rd</sup> Floor Stern Center). These services are there for you to help you cope with difficulties you may be experiencing and to maintain optimal physical and mental health.

COVID-19 has complicated all of our lives. And social distance can easily equate to social isolation--and is especially challenging for those that struggle with mental health issues. So, please everyone, be diligent in taking care of your own mental health and that of others. Check on your friends and stay connected in ways other than just social media (although, please not physically). Here are a couple of additional pages with mental health resources: [Mental Health And COVID-19 – Information And Resources](#)  
[National Institute of Mental Health - Help for Mental Illness](#)

**Preferred names and pronouns:** I will gladly honor your request to address you by the name and gender pronouns of your choice. Please advise me of this early in the semester via your college-issued email account or during office hours so that I may make the appropriate notation on my class list.

**Extra help/learning support:** The Center for Student Learning (CSL) has a walk-in science tutoring lab; however all of their services are currently virtual due to COVID-19. The lab schedules will be posted by September 4th. Stay updated at the CSL website <https://csl.cofc.edu/>.

You will also have a Supplemental Instruction (SI) leader for this class. There will be three virtual SI sessions per week that are associated with only this particular lecture section. Your SI leader will attend all class meetings. I encourage you to attend 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.

**Open educational resources:** This course uses digital course materials designed using [Open Educational Resources](#) (OER), which are high-quality, openly-licensed educational materials, rather than a traditional textbook. You can access all readings, videos, quizzes and other activities through our OAKS course. These course materials were assembled and/or created by a group of Biology faculty with support from CofC's OER Incentive Program. You will not have any additional cost for textbooks in this class. CofC is committed to student access and excellence. Extra care and effort was involved to assure access to high-quality affordable materials. I am interested in your experience using these materials and welcome your feedback at any time during the course of this class.

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

**Grading:**

Grade Scale	Final Lecture 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.  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	8-25	Course introduction	
	8-27	The Study of Life, The Chemical Foundation of Life--Atoms and Bonding	1
2	9-1	The Chemical Foundation of Life--Water, Energy, and Carbon	2
	9-3	Biological Macromolecules	3
3	9-8		
	9-10	Structure and Function of Plasma Membranes	5
4	9-15	The Cell--Inside of the Cell	4
	9-17	The Cell--Outside of the Cell	
5	9-22	<b>Test I available on OAKS from Sun., Sept. 20<sup>th</sup>, at 12:01 AM through Tues., Sept. 22<sup>nd</sup>, at 11:59 PM</b>	1-5
	9-24	Metabolism--Energy and Enzymes	6
6	9-29	Cellular Respiration and Photosynthesis	7-8
	10-1		
7	10-6		
	10-8	Cell Communication	9
8	10-13	Cell Reproduction, Meiosis and Sexual Reproduction	10-11
	10-15		
9	10-20		
	10-22	<b>Test II available on OAKS from Thurs., Oct. 22<sup>nd</sup>, at 12:01 AM through Sat., Oct. 24<sup>th</sup>, at 11:59 PM</b>	6-11
10	10-27	Stem Cells	material in OAKS
	10-29	Mendel's Experiments and Heredity	12
11	11-3	<b>NO CLASSES--Election Day</b>	
	11-5	Mendel's Experiments and Heredity and Modern Understandings of Inheritance	12-13
12	11-10		
	11-12	DNA Replication and Repair	14
13	11-17	Molecular Biology--The Genetic Code, Transcription, and Translation	15
	11-19		
14	11-24	Molecular Biology--Control of Gene Expression	16
	11-26	<b>NO CLASSES--Thanksgiving Break</b>	
15	12-1	<b>Test III available on OAKS from Sun., Nov. 29<sup>th</sup>, at 12:01 AM through Tues., Dec. 1<sup>st</sup>, at 11:59 PM</b>	12-16 and stem cells
	12-3	Biotechnology and Genomics	17
<b>FINAL EXAM available on OAKS on Tues., Dec. 8th, from 1 PM to 3 PM</b>			

**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:

### 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
  - 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.

#### 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 addressed 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

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<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.*