

**BIOLOGY 101–04 CRN 10065.202110
CONCEPTS AND APPLICATIONS IN BIOLOGY
SYLLABUS FOR ONLINE INSTRUCTION FALL 2020**

Instructor: Dr. Andy Shedlock, Biology Department

Scheduled Class Time: MWF 10:00-10:50AM

REQUIRED Synchronized Online Class Activities: WEDNESDAYS 10:00-10:50AM

OPTIONAL Synchronized Online Open Q&A Class Time: MONDAYS 10:00AM-10:50AM

Office Hours: Mondays and Wednesdays after online class time via Zoom or by appointment

Email = shedlockbiol@gmail.com (DO NOT USE shedlockam@cofc.edu)

Textbook: We will not use any particular textbook. Slide sets used in lecture will be made available to students on OAKS. You will need to use internet access via a remote computer connection to function in our online section of the course.

OAKS and ZOOM: All course material will be managed on OAKS, including slides, videos, exams, and quizzes. Synchronized group discussions will use the ZOOM online video conference platform. This means you need to make sure you can function with your computer on OAKS and Zoom in order to participate successfully in the class. Check OAKS daily for updated course info and announcements.

Attendance Policy: Please read the CofC Honor Code (see Appendix I below) and take it seriously. The College uses the Honor Code to enforce respectful honest student behavior according to established institutional policies, so do not make the mistake of ignoring it. **COVID-19:** Because of the pandemic, there will be no use of absentee memos in fall 2020. Functionally, this means there is no formal attendance policy. *Having more freedom requires more responsibility and more honesty, not the opposite.* Attendance is not required in our online section of BIOL 101. This means you will have more freedom to manage your time responsibly without anybody telling you what to do or requiring you to document your absence from class. *HOWEVER...*

No participation = No points. THERE IS NO MAKE-UP POLICY FOR MISSING SYNCHRONIZED CLASS ACTIVITIES ON WEDNESDAYS. *Online participation requires "attendance"* in order for you to earn points for class activities such as exams and quizzes and group discussion. Please note that your remote participation is graded and recorded in detail based on the history of your individual student online activities logged automatically by the OAKS platform. **THEREFORE: You cannot earn points unless you are logged into OAKS on Wednesdays from 1000-1050AM and are focused, engaged, and actively participating during our synchronized online class activities.**

Empowerment, Active Learning, and the Four C's

Our section of Biology 101 is built upon the mission of individual empowerment via active learning skill development and scientific literacy. We will cover major themes of public interest that are relevant to sustainable human welfare and rooted in concepts of evolutionary, molecular, and cellular biology. We will strengthen our scientific literacy and apply it to think **C**ritically, **C**ollaborate productively, **C**ommunicate effectively, and solve problems **C**reatively (The 4 C's). This method of discovery requires curiosity and imagination and a sense of pride in the ownership of your original ideas and team-driven design and production of shared novel course material. For this reason our syllabus is a process-oriented, student-driven, multi-disciplinary vehicle based on a highly successful active learning model that integrates STEAM fields (**S**cience, **T**echnology, **E**ngineering, **A**rt, and **M**ath). This shared experiential approach to education contrasts with the traditional content-heavy fact-oriented didactic lecture model (which has proven to be much less effective for teaching science over the past 100 years and is especially outdated in the age of the internet). This means YOU are going to drive the course forward week by week as a diverse group of collaborative explorers of your own imagination, not passive consumers of somebody else's dogma.

TEN MODERN REAL-WORLD WEEKLY THEMES COVERED IN THIS COURSE

WEEK 1 COVERED BY THEME TEAM 1 ON WEDNESDAY SEPTEMBER 2

Scientific literacy and intellectual self-defense in the age of the internet (e.g., COVID-19)

WEEK 2 COVERED BY THEME TEAM 2 ON WEDNESDAY SEPTEMBER 9

Evolution as a force of nature. Fact YES. Theory YES. Belief system NO.

WEEK 3 COVERED BY THEME TEAM 3 ON WEDNESDAY SEPTEMBER 16

Origins of life. Chemical evolution and the RNA world.

WEEK 4 COVERED BY THEME TEAM 4 ON WEDNESDAY SEPTEMBER 23

Cosmic evolution and astrobiology. Are we alone in the universe?

WEEK 5 COVERED BY THEME TEAM 5 ON WEDNESDAY SEPTEMBER 30

The Central Dogma, Gene regulation, and Epigenomics

WEEK 6 COVERED BY THEME TEAM 6 ON WEDNESDAY OCTOBER 14

Genomics, precision medicine, and synthetic biology

WEEK 7 COVERED BY THEME TEAM 7 ON WEDNESDAY OCTOBER 21

Biodiversity. What is it, why do we need it, how should we manage it?

WEEK 8 COVERED BY THEME TEAM 8 ON WEDNESDAY OCTOBER 28

Pollution, environmental health, and the quest for sustainability

WEEK 9 COVERED BY THEME TEAM 9 ON WEDNESDAY NOVEMBER 4

Population growth, agriculture, water, and food security

WEEK 10 COVERED BY THEME TEAM 10 ON WEDNESDAY NOVEMBER 11

Climate change, carbon cycle, notes from the fossil record and oceanography

EXAM 1 will take place on OAKS during class on WEDNESDAY OCTOBER 7

EXAM 2 will take place on OAKS during class on WEDNESDAY NOVEMBER 18

The **BONUS QUIZ** will take place on OAKS during class on WEDNESDAY DECEMBER 2

The **FINAL EXAM** will take place on OAKS from 8-10AM on WEDNESDAY DECEMBER 9

Weekly Theme Team Voice Thread Presentations

Each week, randomly assigned pairs of students working within each of the 10 weekly Theme Teams will collaborate by creating a 3-minute VoiceThread document due posted on OAKS before class begins on Wednesday at 10AM. All weekly VT docs (one doc per each working pair of students) will be designed to communicate non-overlapping priority learning outcomes for each weekly theme. Time permitting, we will view selected VT docs as part of our weekly in-class review and discussion on Zoom.

Weekly Quizzes

Each Wednesday according to the above weekly theme schedule there will be a 5-question 10-point True/False quiz taken synchronously on OAKS starting at 10AM. The quiz will cover the lecture materials posted online covering the weekly topic and will be "graded" by interactive class-wide group discussion online via Zoom immediately after completion of the quiz.

Quiz Specs

- 10 Wednesday 10AM 5-Q synchronous online quizzes (10 points x 10 weeks = 100 points total)
- 40-point Bonus Quiz on Wednesday December 2 (20 questions with comprehensive coverage for weeks 1 through 10)
- All questions are timed T/F format on OAKS worth 2 points each
- NO MAKE-UP QUIZZES (that's why there is a 20-point bonus quiz)

Exam Specs

- EXAMS 1 and 2 will be taken on OAKS synchronously during Wed class time. Each exam will be 50 T/F questions. Exam 1 covers weekly lecture themes 1-5. Exam 2 covers weekly lecture themes 6-10
- The FINAL EXAM will be taken in two parts and based entirely on student VoiceThread presentations.
- Part 1 (50 T/F questions) will be based on VoiceThread material presented by Theme Teams 1-5
- Part 2 (50 T/F questions) will be based on VoiceThread material presented by Theme Teams 6-10

Point Totals

100 QUIZZES (5Qs x 10 WEEKS = 50 T/F LEC Qs)
100 EXAM 1 (50 T/F LEC 1-5 Qs)
100 EXAM 2 (50 T/F LEC 6-10 Qs)
100 FINAL EXAM PART 1 (50 T/F VT 1-5 Qs)
100 FINAL EXAM PART 2 (50 T/F VT 6-10 Qs)
50 VT DOC COLLABORATIVE TEAM ASSIGNMENT
50 PARTICIPATION (DELIVERING ON TIME, ESP WEDNESDAYS)
600 MAX POINTS = 100% OF CLASS GRADE [+40 MAX BONUS (20 T/F Qs)]

Earned Letter Grade Scale for the Course

≥90% Guarantees A- or higher
≥80% Guarantees B- or higher
≥70% Guarantees C- or higher
≥60% Guarantees D- or higher
<60% = F

APPENDIX I: Other official stuff that is required to be included on this syllabus...

Honor Code and Academic Integrity

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

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 may have the opportunity to meet with the Dean of Students and may be brought before the Honor Board. Depending on the severity, incidents may lead to a written intervention, a XF in the course indicating failure of the course due to academic dishonesty, disciplinary probation, suspension (temporary removal) or expulsion (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.

Parity Statement

Any student eligible for and needing academic adjustments or accommodations through the SNAP program because of a documented disability is requested to speak with the professor in a timely and confidential manner so that your needs can be addressed. Athletes, International or ESL students are encouraged to discuss any concerns with the Instructor in a timely manner.

Material related to the laboratory course that is required to appear in the lecture syllabus Official BIOL 101/L – 102/L Course Learning Goals and Objectives (Re, SACS COC Accreditation)

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 may 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.