COURSE OBJECTIVES - A foundation course for science majors providing an introduction to evolution with an emphasis on the structure, form and function of plants and animals. Students will be exposed to lectures, readings, discussions, videos, and assessment to ensure a thorough, lasting understanding of the material. Completion of this class and the associated laboratory meets a General Education requirement.

SPECIFIC LEARNING OUTCOMES -
1. Demonstrate an understanding of the basics of evolutionary theory; how populations evolve and the causes.
2. Use fundamental population genetics to show evolutionary change in populations.
3. Relate the basic structures of plants and animals to how they operate as organisms.
4. Demonstrate an understanding of the interactions among organ systems in plants and animals.
5. Be able to compare plant and animal adaptations to environments, particularly to life on land.

INSTRUCTOR -
Seth Pritchard
Office: RITA 205
Email: pritchards@cofc.edu

CLASS MEETING TIMES - Lecture is Tuesdays and Thursdays from 8:00-9:15 AM in room 101 RITA. Attendance at lecture is required to succeed in this course! Be advised that there is usually a negative linear relationship between final course grades and number of absences (i.e., your final grade in the class can be predicted quite reliably from the number of absences).

This course is scheduled to be an IN-PERSOON only class. Therefore, lectures will not be recorded. If you miss class, you should get the class notes from someone else so that you don’t fall behind.

OAKS will be utilized for posting lectures, readings, quizzes, assignments, news, Updates, etc.
- New to Oaks? Get up to speed fast with tutorials here: http://blogs.cofc.edu/oaks/students/getting-started/
- Email will be used to communicate important or sudden changes in course information. Please check your CofC email daily

OFFICE HOURS - Tuesdays and Thursdays from 10-11:30.

PREREQS: Successful completion of Biology/Honors 111/151.

Co-REREQUISITE - Biology 112 laboratory is normally a co-requisite, unless students already have credit for the laboratory portion of the course. The laboratory manual for Biology 112L is available at the bookstore.

SUPPLEMENTAL INSTRUCTION - College of Charleston offers supplemental instruction (SI) for courses with especially high attrition rates (i.e., 25% or more of enrollees typically earn grades of D, F, or must withdraw). That means BIOL 112 is considered one of the most difficult courses on campus! Your SI instructor is Caitlin McDade. Caitlin will provide more information about how
this program will work during class. The SI program is provided by the 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. 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.


GRADING

EXAMS- There will be four exams spaced more or less evenly throughout the semester. They will carry equal weight (100 points each); the final exam will be comprehensive (and will be given during finals week) but will emphasize topics covered after Exam III. Exams will be mostly in multiple choice format but may also include some short answer/discussion questions.

QUIZZES- There will be 5 or 6 quizzes/homework assignments during the semester. These will be worth 25 points each. Only the best 4 quiz scores will count (the lowest will be dropped, therefore there will be absolutely NO MAKEUP QUIZZES/HOMEWORK assignments.)

POLLEV- We will have in-class quizzes administered using poll everywhere. The questions given during the semester with pollev will count as one of the quiz/homework assignments mentioned above. This pollev quiz grade will be calculated as: total points received/(1/2 of the total available points). In other words if you we have 30 quiz questions and you get them all correct, your quiz grade would be 30/15 = 2 or 200%. You would receive 50 points out of a possible 25 (this is a good bit of extra credit! Please take advantage of it!!).

SUMMARY: 4 exams: 4 x 100 = 400 points
          4 quizzes/homework assignments: 4 x 25 = 100
          TOTAL POINTS = 500

Final grades will be determined as the % of total points that you have earned throughout the semester as follows:

Grades will be assigned as follows:

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<th>Grade</th>
<th>Score Range</th>
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<tbody>
<tr>
<td>93-100</td>
<td>A</td>
<td>73-76</td>
<td>C</td>
<td>63-66</td>
<td>D-</td>
</tr>
<tr>
<td>90-92</td>
<td>A-</td>
<td>70-72</td>
<td>C-</td>
<td>60-62</td>
<td>D-</td>
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<td>87-89</td>
<td>B+</td>
<td>67-69</td>
<td>D+</td>
<td>0-59</td>
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<td>83-86</td>
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<td>63-66</td>
<td>D</td>
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<tr>
<td>80-82</td>
<td>B-</td>
<td>60-62</td>
<td>D-</td>
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<td>77-79</td>
<td>C+</td>
<td>0-59</td>
<td>F</td>
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TENTATIVE LECTURE SCHEDULE*

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Chapter</th>
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<tbody>
<tr>
<td>Jan 11, 13</td>
<td>Study of life, Evolution</td>
<td>1, 18</td>
</tr>
<tr>
<td>Jan 18, 20</td>
<td>Evolution- Natural selection</td>
<td>18</td>
</tr>
<tr>
<td>Jan 25, 27</td>
<td>Evolution- Speciation</td>
<td>19</td>
</tr>
<tr>
<td>Feb 1,</td>
<td>Evolution- Wrap up</td>
<td>19</td>
</tr>
<tr>
<td>Feb 3</td>
<td>EXAM I</td>
<td></td>
</tr>
<tr>
<td>Feb 8, 10</td>
<td>Plants- reproduction</td>
<td>32</td>
</tr>
</tbody>
</table>
Feb 15, 17  Plants- Structure, growth and development  30
Feb 22, 24  Plants- Vascular plant transport  30
March 1  Plants- Nutrition and soils  31
March 3  EXAM II

March 8, 10  SPRING BREAK

March 15, 17  Animals- Form and function, Nutrition  33, 34
March 22, 24  Animals- Nutrition, Gas exchange  39
March 29, 31  Animals- Osmoregulation  41
April 5  Animals- Nervous system  35
April 7  EXAM III

April 12, 14  Animals- Nervous system, Immunity  35, 42
April 19, 21  Animals- Immunity, reproduction  42, 43

April 28  EXAM IV (8-10 AM in RITA 101)

*This schedule will almost certainly change. You must attend class in order to keep up with any schedule changes.

Inclement Weather, Pandemic or Substantial Interruption of Instruction

If in-person classes are suspended, faculty will announce to their students a detailed plan for a change in modality to ensure the continuity of learning. 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.

F2F courses when students are quarantined/isolated due to Covid-19

If one or more students are absent for an extended period of time due to COVID-19 (quarantine or isolation), instructors may, at their discretion, conduct the class exclusively online via OAKS for the duration of student quarantine/isolation, record class lessons to share with students, or choose an alternate accommodation that provides the impacted student(s) with the opportunity to continue in the course. The specific accommodation will vary depending on the number of students affected, the expected duration of their absence, and the needs of the class.

Attendance Verification

Only students officially registered (graded or auditing) for this course may attend class. During the week following the drop/add deadline, the professor will verify student enrollments in this course. Any student appearing on the class roll but determined not to have attended the class even once will be removed, except for cases where a student is absent because of quarantine or isolation due to COVID-19.

Online Courses with Exam Proctoring

This course might (if in-class examinations prove unsafe during the course of the semester) require the use of an exam proctoring service for the course exams. Students are responsible for registering, scheduling, and the cost of the service prior to each exam. Instructions and additional information on proctoring can be found at https://online.cofc.edu/faculty-training-resources/index.php.

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 3rd 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 3rd 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. Food & Housing Resources: Many CofC students report experiencing food and housing insecurity. If you are facing challenges in securing food (such as not being able to afford groceries or get sufficient food to eat every day) and housing (such as lacking a safe and stable place to live), please contact the Dean of Students for support (http://studentaffairs.cofc.edu/about/salt.php). Also, you can 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, there are several resources on and off campus to help. 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. Please also consider reaching out to Professor ABC if you are comfortable in doing so.
Inclusion

The College of Charleston offers many resources for LGBTQ+ students, faculty and staff along with their allies.

- Preferred Name and Pronoun Information
- On Campus Gender Inclusive facilities
- Campus Resources
- College of Charleston Reporting Portals
- National Resources for Faculty & Staff
- GSEC Reports
- Documenting LGBTQ Life in the Lowcountry (CofC Addlestone Library Special Collections Project)
- College of Charleston Quality Enhancement Plan (QEP)
- Articles about CofC and LGBTQ+ Issues

COLLEGE OF CHARLESTON 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.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XF 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 X 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.

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

Use of Electronic Devices: During in class work, I will NOT allow any electronic devices, i.e. computers, phones, tablets. You will actually need to write notes. The physical act of writing helps you place information into more permanent memory. Lecture slides will be posted on Oaks after the lectures.
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 & Biology 112L**
- 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 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**

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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.*

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.*
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