



Course syllabus: Biology 111. Introduction to Cell and Molecular Biology - Fall 2017

Instructor: Subhajit Dasgupta, Ph.D

Office hours: By appointment

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Text Book: Biological Sciences, 6th edition; by Scott Freeman *et al.* (*Online access with code will be through MasteringBiology site, publisher: Pearson Education Inc.*)

Lecture time and location: **Time:** 3PM till 3:50 PM; **Days:** MWF **Location:** College of Charleston: School of Science/Math building (SSMB) Room No. 129.

Credit hours: 3

Learning Goals & Objectives

The subject, Biological Sciences provides a background for understanding and evaluating contemporary topics in biology. The course is designed for students with biology major and other streams of biological sciences to develop a foundational knowledge of core concepts. The acquired knowledge will lead the students to develop foundation of 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

The key concepts covered in Biology 111 course material are,

Biology 111 - Introduction to Cell and Molecular Biology

- [Exploring Life](#)
- [Basics of Chemistry](#)
- [Water's Life Supporting Properties](#)
- [Organic molecules](#)
- [Cell Form & Function](#)

- [Energetics, Enzymes and Metabolism](#)
- [Cellular Respiration](#)
- [Photosynthesis](#)
- [The Cell Cycle](#)
- [Meiosis and Sexual Life Cycles](#)
- [Mendelian Genetics](#)
- [The Chromosomal Basis of Inheritance](#)
- [The Molecular Basis of Inheritance](#)
- [From Gene to Protein](#)
- [Regulation of Gene Expression](#)
- [Viruses](#)
- [Biotechnology](#)
- **Genomes and Their Evolution - under construction**

Learning outcomes

Upon completion of course, the students will develop rationale on studying biological sciences. The students will be expected to apply the acquired knowledge to solve queries in life and science. The course cover the basics of Biological sciences 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 TRANS FORMATIONS 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 the course include:

- Chemical and physical properties of life
- Cell form & function
- Energetics, metabolism, and photosynthesis
- The cell cycle
- o Mitosis and cell reproduction
- o 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

Core Competencies

· Nature of Scientific Knowledge

o 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.

o 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.

o Understand that science operates in a world defined by the laws of chemistry and physics.

o Understand the differences and relationships among scientific theories, hypotheses, facts, laws, & opinions.

o Understand the differences between science and technology, but also their interrelations.

o Understand the dynamic (tentative) nature of science.

- Scientific Methods of Discovery

o 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).

o Apply physical/natural principles to analyze and solve problems.

- Develop a Scientific Attitude

o Develop habits of mind that foster interdisciplinary and integrative thinking (within biology; between biology and other sciences; between science and other disciplines).

o Develop an appreciation for the scientific attitude - a basic curiosity about nature and how it works.

- Develop scientific analysis and communication skills

- o 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).
- o Understand the probabilistic nature of science and the use/application of inferential statistics to test hypotheses.
- o Develop scientific information literacy (library, internet, databases etc...); find and evaluate the validity of science-related information.
- o 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.).
- o 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.
- o Develop an appreciation of humans as a part of the biosphere and the impact of biological science on contemporary societal/environmental concerns.
- o Knowledge of the history of the biological sciences and the influences of politics, culture, religion, race, and gender on the scientific endeavor.

Course Description: The Biology course 111 builds a scientific base in students of science majors. The course contents emphasize on interactive learning with rationale. The course topics are quite comprehensive of logical thoughts on beginning of life through structure and function in biological systems at the molecular and cellular levels to the biological factors playing key roles for growth and propagation of life.

The core of the topics include the scientific processes, biochemistry, molecular biology, cell structure and function, respiration, photosynthesis, and genetics. Completion of this class and the associated laboratory meets a General Education requirement.

Pre-requisites: None; Co-requisites: Biol 111 Laboratory

Grading: The final grade will be calculated as the % of total earned points throughout the semester. The table shows the grades (%) and number of different evaluations

Grade Scale (%)	Grade	Final grade calculation (Total grade: 800)
93-100	A+	10 Quizzes, 15 points each ; 4 assignments (25 points each) Exams (3) : 100 points each Final Exam: 250 points
90-92	A	
87-89	B+	
83-86	B	
80-82	B-	
77-79	C+	
73-76	C	
70-72	C-	
67-69	D+	
63-66	D	
60-62	D-	
0-59	F	
*Grades C and below should report to Instructor for improvement in course grade		

Students should have access to the Center for Student Learning’s academic support services <http://csl.cofc.edu> . Per requirement, a student can get variety of services, including study strategies, speaking and writing strategies, and course content. The center provides tutoring, supplemental instruction, and workshops.

Attendance Policy:

Before attending the class, you must meet all the prerequisites and officially register for this course. The attendance is necessary in order to be successful in this class. Students are encouraged to attend all of the classes. In order to verify your enrollment there will be an attendance sheet, which you must sign during the first two weeks. Failure to sign the sheet will result in students being dropped from the course.

Test make-ups are strongly discouraged and will not generally be allowed unless the student can properly justify the absence with documentation. If you miss a scheduled exam, you must notify me within 24 hours to schedule a make-up exam. Only one make-up exam is allowed, and only with a valid, documented excuse.

Quizzes are generalized from regular announced to pop quizzes. The quizzes will consist of short answer, multiple choice, matching, and true or false questions on the topics already covered by instructor. There are **NO MAKE UP QUIZZES**. Assignments will be posted on OAKS. All assignments are to be turned in by the due date in lecture and will not be accepted late. I’ll **not accept** electronic submissions from students.

Disabilities: The College will make reasonable accommodations for individuals with documented disabilities. Students should apply for services 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.

Academic Dishonesty:

Academic dishonesty will not be tolerated at College of Charleston. Academic dishonesty includes, but is not limited to, inappropriate use of a college computer or cell phone, unauthorized collaboration, plagiarism, and falsification of information. Students are responsible for adhering to all the policies and procedures in the College of Charleston Student Handbook.

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. Students can find the complete Honor Code and all related processes in the *Students' Handbook* at <http://www.cofc.edu/generaldocuments/handbook.pdf>

When a student is suspected of violating the Honor Code, he or she will be reported to the Dean of Students by the instructor. Furthermore, students will receive a XXF for the course to indicate course failure as a result of academic dishonesty. This notation will remain for two years, after which the student may petition to have it expunged. However, the F will remain on the student's record. Individuals may also be subject to disciplinary probation, suspension, or expulsion from College of Charleston by the Honor Board.

Use of Cell Phones and Computers:

Please turn all electronic devices off or on vibrate before entering class.

Bio 111 Lecture Schedule Fall– 2017 (Subject to change with notice)

Dates	Topics	Chapters
Wednesday, Aug 23 rd	Overview of Syllabus; Introduction to course: Biology and Tree of life	1
Friday, Aug 25 th	Introduction to course: Biology and Tree of life	1
Monday , Aug 28 th	Water and Carbon: Chemical Basis of Life	2
Wednesday, Aug 30 th	Water and Carbon: Chemical Basis of life	2
Friday, Sept 1 st	Protein: Structure and Function	3
Monday, Sept 4 th	Nucleic acid and RNA world	4
Wednesday, Sept 6 th	Quiz 1 (Chapters 1,2) Nucleic acid and RNA world	4
Friday, Sept 8 th	Nucleic acid and RNA world	4
Monday, Sept 11 th	Introduction to Carbohydrates	5
Wednesday, Sept 13 th	Introduction to Carbohydrates	5
Friday, Sept 15 th	Quiz 2 (Chapters 3,4) ; Assignment 1	

Monday, Sept 18th	Exam 1 (Chapters 1 to 4)	
Wednesday, Sept 20 th	Lipids and membranes	6
Friday, Sept 22 nd	Lipids and membranes	6
Monday, Sept 25 th	Quiz 3 (Chapters 5, 6) Inside the cells	7
Wednesday, Sept 27 th	Inside the cells	7
Friday, Sept 29 th	Energy and Introduction of metabolism	8
Monday, Oct 2 nd	Energy and Introduction of metabolism	8
Wednesday, Oct 4 th	Cellular respiration and fermentation	9
Friday, Oct 6 th	Assignment 2; Cellular respiration and fermentation	9
Monday, Oct 9 th	Quiz 4 (Chapters 7 to 9); Photosynthesis	10
Wednesday, Oct 11 th	Photosynthesis	10
Friday, Oct 13 th	Quiz 5 (Chapter 10); Cell-Cell Interactions	11
Monday, Oct 16th	Fall Break	
Wednesday, Oct 18 th	Cell Cycle	12
Friday, Oct 20 th	Quiz 6 (Chapters 11) Meiosis	13
Monday, Oct 23 rd	Meiosis	13
Wednesday, Oct 25th	Exam 2 (Chapters 5 to 11)	
Friday, Oct 27 th	Mendel and Gene	14
Monday, Oct 30 th	Mendel and Gene	14
Wednesday, Nov 1 st	Quiz 7 (Chapters 12 and 13) Mendel and Gene	14
Friday, Nov 3 rd	DNA and Gene: synthesis and repair	15
Monday, Nov 6 th	DNA and Gene: synthesis and repair	15
Wednesday, Nov 8 th	Quiz 8 (Chapters 14 and 15) How Genes work	16
Friday, Nov 10 th	Assignment 3 Transcription RNA processing and translation	17
Monday, Nov 13 th	Transcription and translation	17
Wednesday, Nov 15 th	Control of gene expression in bacteria	18
Friday, Nov 17 th	Quiz 9 (Chapters 16 and 17); Control of gene expression in bacteria	18
Monday, Nov 20th	Exam 3 (Chapters 12 to 17)	
Wednesday, Nov 22nd	Thanksgiving Holiday	
Friday, Nov 24th	Thanksgiving Holiday	
Monday, Nov 27 th	Control of gene expression in bacteria	18
Wednesday, Nov 29 th	Control of gene expression in eukaryotes	19
	Control of gene expression in eukaryotes	19
Friday, Dec 1 st	Quiz 10 (Chapter 18,19) (Open book) Control of gene expression in eukaryotes	19
Monday, Dec 4 th	Assignment 4 Review	
Wednesday, Dec.13th	Final Exam (Cumulative).	

Additional Information:

- **Make sure that you check your college Email Daily!**
 - All communication pertaining to the lecture and lab will be done through your college e-mail and OAKS account.
 - You are responsible for all the information provided in the e-mails sent to you, and you must check for messages on a daily basis throughout the entire semester, including the weekend.
- **Where to find your grades:**
 - The grades will be posted on OAKS.
- **PowerPoints will be posted on OAKS.**
 - I use PowerPoints during the lecture, and I also place notes on the board.
- **Extra Credit Policy:**
 - I do not offer any additional work for extra credit

Important Dates:

- **Monday August 28th** - Drop/Add
- **Thursday October 26** - last day to withdraw with a “W” grade
- **Wednesday December 13** – Final Exam (4pm – 7pm)