

BIOE 1010: Biology for Bioengineers – Sec 001

Term: First Spring 2024

January 8, 2024 - March 1, 2024

Important Dates:

Jan 15: Martin Luther King Jr. Holiday

Jan 17: Last day to register or add a class

Jan 24: Last day to drop a class or withdraw without a W grade

Feb 12: Last day to drop a class or withdraw without final grades

Mar 1: Final Exam (Quiz 4)

Class Meeting Time and Place:

Mondays and Wednesdays 8am – 8:50am

Rhodes Annex 109

Time to Wait:

If I do not arrive within **15 minutes**, you may assume class is cancelled and are dismissed.

Information on Modality:

This class is fully **in-person** and **synchronous**.

Instructor Name:

Tyler Harvey, PhD

Lecturer of Bioengineering

Instructor Email:

tgharve@clemson.edu



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ALUMNI

I do my best to respond to email inquiries within 24 hours, excluding weekends and university holidays. If you do not receive a response in this timeframe, feel free to send a polite reminder. For the fastest response, I encourage you to include the course number (BIOE 1010) in the subject line of your email.

University Office Phone:

864-565-8616

Office Location:

313 Rhodes Engineering Research Center (Old Rhodes)

If you enter the building on the third floor (next to library bridge), take an immediate right and walk all the way down the hall. You will come to a small kitchen area where the annex begins. My office is directly to the right of this kitchen area, next to the staircase.

Office Hours:

Office hours are an opportunity for you to further discuss course concepts, ask advising questions about major/concentration choices or your future plans, to get to know me better, or just to discuss life in general.

These can be done in-person or via Zoom by scheduling an appointment online at <http://tgharve.youcanbook.me>

If you choose the Zoom option, a meeting link will be emailed to you automatically. You are also free to stop by my office without an appointment at any other time and I will be happy to meet with you if I'm not otherwise busy.

Course Description:

Provides basic introduction to fundamental principles of molecular and cellular biology.

Prerequisites:

None

Course Overview:

This course is designed to provide freshman general engineering and/or bioengineering students a comprehensive overview of cellular biology necessary for success in the bioengineering curriculum.

This course is just one of several options for satisfying the biology requirement to transfer from general engineering into bioengineering. The other options are BIOL 1030 or BIOL 1110, which are 3 credit/4 credit courses taught in the biological sciences department. These courses cover all the topics that we will cover in this course, but also include additional information about plants, population-level biology, and genetics. In general, in this course we will only focus on human biology and will limit our discussion to within and around single cells. If you are interested in topics in biology beyond this scope, if you are considering applying to medical school in the future, or if you intend to minor in another life-science discipline (such as biological sciences, genetics, or biochemistry), you may consider taking one of these other courses instead.

Learning Objectives:

After completing this course, we will be able to:

1. Recognize structures of the four major classes of building-block molecules (monomers) that make up cellular macromolecules and membranes.
2. Explain the underlying mechanisms that govern interactions between biological molecules.
3. Given the thermodynamic and kinetic characteristics of a biochemical reaction, predict whether it will proceed spontaneously and the rate at which it will proceed.

4. Outline the flow of matter and energy in the processes by which organisms fuel growth and cellular activities and explain how these processes conform to the laws of thermodynamics.
5. Compare how the properties of water affect the three-dimensional structures and stabilities of macromolecules, macromolecular assemblies, and lipid membranes.
6. From their structures, predict which solutes will be able to diffuse spontaneously through a pure phospholipid bilayer membrane and which will require transport by membrane-associated proteins.
7. Identify the structural differences that dictate the different functional characteristics of nucleic acids.
8. Using diagrams, demonstrate how the information in a gene is stored, replicated, and transmitted to daughter cells.
9. Describe how the information in a gene directs expression of a specific protein.

Required Materials:

E.V. Wong (2009). Cells: Molecules and Mechanisms. Axolotl Academic Publishing: Louisville, KY. ISBN 978-0-9852261-1-4

Free PDF available at http://www.axopub.com/Downloads/Cells/cells_complete.pdf

Topical Outline:

Date	Topic / Module	Assessments
W 1/10/24	Course Introduction, Chemistry Review	
M 1/15/24	MARTIN LUTHER KING JR DAY – NO CLASS	
W 1/17/24	Proteins, Enzymes, Bioenergetics	Homework 1
M 1/22/24	Lipids and Membranes, Electrophysiology	Homework 2
W 1/24/24		Quiz 1
M 1/29/24	Glycolysis	
W 1/31/24	TCA Cycle, Oxidative Phosphorylation	
M 2/5/24	Fermentation, Anabolic Processes	Homework 3
W 2/7/24		Quiz 2
M 2/12/24	Nucleic Acids, DNA Replication	
W 2/14/24	Transcription and Translation	
M 2/19/24	Cell Cycle and Cancer	Homework 4
W 2/21/24		Quiz 3
M 2/26/24	Cell Communication, Growth factors	
W 2/28/24	Cytoskeleton and Extracellular Matrix	Homework 5
F 3/1/24		Quiz 4 (8am)/Homework 6

Assessment

Homework¹ (6): 25%

Module Quizzes² (4): 60%

Biology in the News Discussion Board³ (1): 5%

Attendance and Participation⁴: 10%

¹**Homework:** Due to the fast pace of the material, completion of the homework activities (2 per module, posted in Canvas) is required.

²**Quizzes:** Instead of tests, the bulk of student assessment will be done through module quizzes given during class the week following the completion of each module, or during the final exam time (quiz 4) as scheduled by the Registrar's office.

At least one full week notice will be given if there is any deviation from the tentative schedule. The quizzes may be a combination of true/false, multiple choice, and short answer questions and will generally only cover material from the preceding module, although due to the cumulative nature of the material, any previously discussed topic could be included on a quiz.

Missing a quiz due to unexcused absence will result in a grade of zero for that quiz. Make-up quizzes will be offered if missed due to a university approved absence (illness, death in the family, conference travel, varsity athletics, etc.) If you will miss a quiz due to an excused absence you **MUST** inform the instructor before the class period in which the quiz is given and must provide documentation before the make-up will be given.

³**Biology in the News Discussion Board:** Another important skill of bioengineers is to be read and interpret popular media coverage of topics in biology, healthcare, and related fields, analyze them from an evidence-based perspective, and share their assessment with others. This is especially relevant during the current pandemic and in an era where misinformation is rampant. To this end, every student will share a short summary of a relevant biology/bioengineering/healthcare related topic that they come across in the news, social media, online, etc in an online discussion board. This is an opportunity to share something you are interested in or passionate about but should be based on sound scientific backing (i.e. no opinion pieces.)

⁴**Attendance and Participation:** Since we meet for only half the semester, failure to attend class regularly will result in falling significantly behind in the course material. We will also engage in some class discussions and in-class activities, which are impossible to replicate outside of class times. You are allowed two (2) unexcused absences. Every additional absence, significant tardiness (>10 minutes), or lack of participation in class activities will result in a reduction of 1 point from the final grade.

Grading System

Letter	Points/Percentages
A	90.0 – 100
B	80.0 – 89.9
C	70.0 – 79.9
D	60.0 – 69.9
F	<60.0

Grading Policies:

I reserve the right to offer extra credit assignments at any point during the semester. These opportunities will be voluntary and made available to all students. I also reserve the right to curve grades on any homework assignments or quizzes and to curve final grades at the end of the course. This process will always be to the benefit of the student. *Neither extra credit nor curving are guaranteed and should NOT be counted on when students assess their current standing in the course.*

Late Work:

While you should endeavor to turn all assignments in on time, I recognize that sometimes circumstances arise that makes this a challenge. Therefore, late work (exclusive of quizzes) will be accepted via Canvas or in person up until the point where the assignment has been graded and grades entered to Canvas.

Beyond this, late work will not be accepted unless there are extenuating circumstances. Email your instructor if you have a special case that requires turning work in late.

Notification of Absence:

The **Notification of Absence module in Canvas** allows students to quickly notify instructors (via an email) of an absence from class and provides for the following categories: court attendance, death of immediate family member, illness, illness of family member, injury, military duty, religious observance, scheduled surgery, university function, unscheduled hospitalization, other anticipated absence, or other unanticipated absence.

The notification form requires a brief explanation, dates and times. Based on the dates and times indicated, instructors are automatically selected, but students may decide which instructors will receive the notification. This does not serve as an “excuse” from class. It is a request for an excused absence and students are encouraged to discuss the absence with instructors, as the instructor is the only person who can excuse an absence. If students are unable to report the absence by computer, they may reach the Office of Advocacy and Success. Students with excessive absences who need academic or medical assistance can also contact the Office of Advocacy and Success.

Inclement weather or emergency: Regularly scheduled exams and assignments may need to be adjusted based on unforeseen circumstances. The Faculty Senate Scholastic Policies Committee suggests the following policy, which you may copy into your syllabus:

Academic Integrity

As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form.

All infractions of academic dishonesty by undergraduates must be reported to Undergraduate Studies for resolution through that office. In cases of plagiarism instructors may use the Plagiarism Resolution Form.

See the [Undergraduate Academic Integrity Policy](#) website for additional information and [the current catalogue](#) for the policy. For graduate students, see the current [Graduate School Handbook](#) for all policies and procedures.

Accessibility

Clemson University values the diversity of our student body as a strength and a critical component of our dynamic community. Students with disabilities or temporary injuries/conditions may require accommodations due to barriers in the structure of facilities, course design, technology used for curricular purposes, or other campus resources. Students who experience a barrier to full access to this class should let the instructor know and make an appointment to meet with a staff member in Student Accessibility Services as soon as possible. You can make an appointment by calling 864-656-6848, by emailing studentaccess@lists.clemson.edu, or by visiting Suite 239 in the Academic Success Center building. Appointments are strongly encouraged – drop-ins will be seen, if at all possible, but there could be a significant wait due to scheduled appointments. Students who have accommodations are strongly encouraged to request, obtain and send these to their instructors [through the AIM portal](#) as early in the semester as possible so that accommodations can be made in a timely manner. It is the student's responsibility to follow this process each semester.

You can access further information at the [Student Accessibility website](#). Other information is at the university's [Accessibility Portal](#).

The Clemson University Title IX Statement Regarding Non-Discrimination

The Clemson University Title IX statement: Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This [Title IX policy](#) is located on the Campus Life website. Ms. Alesia Smith is the Clemson University Title IX Coordinator, and the Executive Director of Equity Compliance. Her office is located at 223 Brackett Hall, 864-656-0620. Remember, email is not a fully secured method of communication and should not be used to discuss Title IX issues.

Clemson University aspires to create a diverse community that welcomes people of different races, cultures, ages, genders, sexual orientation, religions, socioeconomic levels, political perspectives, abilities, opinions, values and experiences.

Emergency Preparation

Emergency procedures have been posted in all buildings and on all elevators. Students should be reminded to review these procedures for their own safety. All students and employees should be familiar with guidelines from the Clemson University Police Department. [Visit here for information about safety.](#)

Clemson University is committed to providing a safe campus environment for students, faculty, staff, and visitors. As members of the community, we encourage you to take the following actions to be better prepared in case of an emergency:

1. Ensure you are signed up for [emergency alerts](#)
2. Download the [Rave Guardian app](#) to your phone
(<https://www.clemson.edu/cusafety/cupd/rave-guardian/>)
3. Learn what you can do to [prepare yourself](#) in the event of an active threat
(<http://www.clemson.edu/cusafety/EmergencyManagement/>)