

Cell and Molecular Engineering Course Syllabus

Course Syllabus – Fall 2025

BMEN3331.001.25F (3 Semester Credit Hours)

Monday, Wednesday

10:00 AM – 11:15 AM

[FO 2.404](#)

- First Class: August 25, 2025
- Final Class (Exam #3): December 8, 2025
- Report Topic Submission: September 17, 2025
- Draft Report Due: October 8, 2025
- Final Report Due: December November 19, 2025
- Lectures are in-person

Course Information

<i>Course Number/Section</i>	<i>BMEN 3331.001</i>
<i>Course Title</i>	<i>Cell and Molecular Engineering</i>
<i>Term</i>	<i>Fall 2025</i>

Professor Contact Information

<i>Professor</i>	<i>Polimyr Caesar Dave P. Dingal, Ph.D.</i>
<i>Office Phone</i>	<i>972.883.5161</i>
<i>Email Address</i>	<i>davedingal@utdallas.edu</i>
<i>Office Location</i>	<i>BSB, 13.530</i>
<i>Online Office Hours</i>	<i>Tuesday 10-11 am on MS TEAMS (email first to set up individual meeting)</i>

Teaching Assistant Contact Information

None

Course Pre-requisites, Co-requisites, and/or Other Restrictions

Prerequisite: MATH 2420. Prerequisite or Corequisite: CHEM 2324.

Course Description

This course will cover physiological function from a cellular, molecular, and biophysical perspective, with applications to bioengineering design. Topics include protein structure and function, enzymes, the structure and nature of DNA,

gene expression, protein trafficking, the cellular structure and function of various cellular organelles. Modern methods for designing, producing, and characterizing novel proteins and peptides will be examined. Students will also learn about energy and the function of mitochondria, cellular communication and the function of the extracellular matrix, cell motility, cell division, cell signaling, and cell adhesion. Prerequisite: MATH 2420. Prerequisite or Corequisite: CHEM 2324. (3-0) S

Student Learning Objectives/Outcomes

Program Educational Objectives (PEOs):

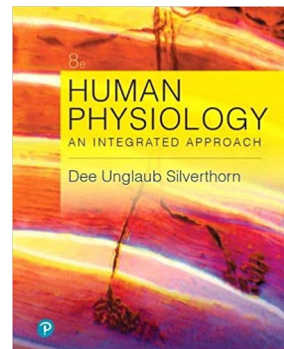
Biomedical Engineering Bachelor's graduates are expected to attain the following Program Educational Objectives within a few years after graduation:

- Careers that lead to leadership roles in biomedical engineering or related fields OR
- Gain admission to graduate, professional, or health related programs

Course Learning Objective (CLO)	Student Outcome (SO)
1. Apply engineering concepts to physiological systems.	1) Apply the concepts of molecular and cell biology to solve biomedical engineering problems.
2. Design an engineering system to study biophysical processes within realistic and ethical constraints.	6) Interpret data from physiological experiments and apply the interpretation to intervene in pathological conditions.
3. Ability to research relevant progress related to an application of physiology.	7) Research and apply state-of-the-art technologies to address a specified pathophysiological condition.

Textbooks and Materials

Human Physiology: An Integrated Approach 8th Edition by Dee Silverthorn (Author), Pearson; 8th edition (January 3, 2018). ISBN-10: 0134605195; ISBN-13 : 978-0134605197



Class Schedule

WEEK/ DATES	TOPIC/LECTURE	READING	ASSESSMENT / ACTIVITY
1 08/25 & 08/27	Introduction to Physiology	Chapter 1	
2 09/01 & 09/03	Molecular Interactions (Chapter 2)	Chapter 2	
3/4 09/08 & 09/10	Compartmentation: Cells and Tissues	Chapter 3	Intro to PDB and PyMOL Identify class partner and your protein and submit PDB IDs for approval by 09/17
4 09/15 & 09/17	Energy and Cellular Metabolism	Chapter 4	09/17 Exam #1 (Chapters 1-4)
5 09/22 & 09/24	Membrane Dynamics	Chapter 5	
6 09/29 & 10/01	Communication, Integration, and Homeostasis Cancer – When communication goes wrong	Chapter 6	
7 10/06 & 10/08	Introduction to the Endocrine System	Chapter 7	Generate PyMOL figures and Submit Draft Report by 10/08
8 10/13 & 10/15	Synthetic Biology		

WEEK/ DATES	TOPIC/LECTURE	READING	ASSESSMENT / ACTIVITY
9 10/20 & 10/22	Systems Biology		
10 10/27 & 10/29	Blood	Chapter 16	10/29 Exam #2 (Chapters 5-7, Sys/SynBio)
11 11/03 & 11/05	The Digestive System	Chapter 21	
12 11/10 & 11/12	Metabolism and Energy Balance	Chapter 22	
13 11/17 & 11/19	Endocrine Control of Growth and Metabolism	Chapter 23	Submit Final Report by 11/19
14 11/24 & 11/26	No Class Fall and Thanksgiving Break		
15 12/01 & 12/03	The Immune System	Chapter 24	
16 12/08			12/08 Exam #3 (Chapters 16, 21-24)

Grading Policy

The course will contain three exams (25%, 25%, 30%; 75% total), class attendance/participation (10%), one class report (Draft 5%, Final 10%).

1. Exams (25, 25, 30)

Exams will be conducted in-class (or possibly online or in the testing center, at the discretion of the instructor). Any changes in format will be discussed well in advance of the exam date. You will have 75 minutes to complete the exam once you begin. No communication with other individuals in the course is permitted during the exam.

2. Class Attendance/Participation (10)

Class attendance/participation will be noted.

3. Report Details (10)

Proteins carry out nearly all cell functions, and their activity depends on their 3D structure. You will select a protein from the Protein Data Bank (PDB), analyze its structure using PyMOL, and **write a short 3-page report (Times New Roman font size 12, 1" margins)** highlighting the structural features of your protein and their functional roles. This will exercise will strengthen your skills molecular visualization, structural interpretation, and technical communication.

Report Objectives:

- Learn to navigate and extract information from PDB.
- Practice using PyMOL to generate high-quality protein structure figures
- Describe and analyze structural features (e.g., 2^o structure, binding sites)
- Research and write how protein structure enables function
- Connect structure-function knowledge to biomedical or engineering applications.

Report Instructions:

1. Choose a protein and class report Partner ([submit for approval by 09/17](#))
 - a. Select a protein of interest that you and your Partner will report on.
 - b. Make sure the structure is complete enough (avoid fragments).
 - c. Record the PDB ID, name, source organism, and resolution.
 - d. **Email above details to instructor with Subject line: BMEN3331 Report.** Include you and your partner's name.
2. Analyze in PyMOL and explore protein structure using different representations (cartoons, sticks, surface, etc.). For the report, capture at least 3 annotated screenshots that highlight features you want to write about.
3. Write the Report ([email draft by 10/08](#) with Subject line above; [final report by 11/19](#)). The following sections will be graded:
 - a. **Introduction** (0.5-1 page). Background of the protein and its biological importance.

- b. **Methods** (0.5 page). Describe how you obtained and visualized the protein (PDB ID, chains analyzed, and PyMOL commands/representations used).
- c. **RESULTS** (0.5-1 page). Structural description with annotated figures. Discuss domains, secondary structures, and functional regions.
- d. **Discussion** (0.5-1 page). Explain how the structure supports function. Including literature/information on mutations, drug inhibitors, or engineering applications if known.
- e. **References** (not counted towards page limit). Cite the PDB entry and at least 3 original research or review articles. Use a consistent citation style (APA, Vancouver, etc.).

4. Deliverables:

- a. Written Report in PDF format.
- b. PyMOL Session File (.pse) and (optional) images folder.

5. Report Grading Rubric:

	Points	Description
Clarity of Writing	20	Report is well-structured, clear, and free of major errors.
Accuracy of Structural Analysis	30	Correct identification and explanation of key structural features.
Quality of PyMOL figures	20	Figures are clear, well-labeled, and effectively illustrate the discussion.
Discussion of Structure-Function Link	20	Demonstrates clear understanding of how structure relates to protein function.
References and Formatting	10	Properly cited literature and PDB entry, consistent formatting.

100

Grade	Points	Grade	Points	Grade	Points	Grade	Points
A+	97-100	B+	87-89.9	C+	77-79.9	D+	67-69.9
A	93-96.9	B	83-86.9	C	73-76.9	D	63-66.9
A-	90-92.9	B-	80-82.9	C-	70-72.9	D-	60-62.9
						F	<60

Course & Instructor Policies

Please contact the Dr. Dingal for any clarifications on the topics.

Late/Missed Work

Late or missed work will not be accepted unless University-approved excuse is received within one week of the assignment.

Attendance and Drop Policy:

No mandatory attendance but STRONGLY encouraged. If you are dropped from this class for non-payment of tuition, you may secure an Enrollment Loan through the Bursars Office. You may not continue to attend class until your Enrollment Loan has been applied to outstanding tuition fees.

Academic Dishonesty

Academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form at The University of Texas at Dallas. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Academic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. (see Regents Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2., Subdivision 3.22).

Disability Services

Disability services are offered to students who have or feel they may have a disability. Please visit the Student AccessAbility at UTD (<http://www.utdallas.edu/studentaccess/>) to learn more about physical, mental or sensory disabilities and how to get documentation for special requests.

Class Materials

The instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course, however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class, or uploaded to other online environments except to implement an approved Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

Classroom Conduct Requirements Related to Public Health Measures

UT Dallas will follow the public health and safety guidelines put forth by the Centers for Disease Control and Prevention (CDC), the Texas Department of State Health Services (DSHS), and local public health agencies that are in effect at that time during the Fall 2021 semester to the extent allowed by state governance. Texas Governor Greg Abbott's Executive Order [GA-38](#) prohibits us from mandating vaccines and face coverings for UT Dallas employees, students, and members of the public on campus. However, we strongly encourage all Comets to get

vaccinated and wear face coverings as recommended by the CDC. Check the [Comets United: Latest Updates webpage](#) for the latest guidance on the University's public health measures. Comets are expected to carry out [Student Safety](#) protocols in adherence to the Comet Commitment. Unvaccinated Comets will be expected to complete the [Required Daily Health Screening](#). Those students who do not comply will be referred to the Office of Community Standards and Conduct for disciplinary action under the [Student Code of Conduct – UTSP5003](#).

Class Attendance

Students who fail to attend class regularly are inviting scholastic difficulty. Faculty have the discretion to set an attendance policy for their in-person meetings, but the absences due to illness must have a doctor's note for them to not be counted against a student.

Class Participation

Regular class participation is expected. Students who fail to participate in class regularly are inviting scholastic difficulty. A portion of the grade for this course is directly tied to your participation in this class. It also includes engaging in group or other activities during class that solicit your feedback on readings or materials covered in the lectures (and/or labs). Class participation is documented by faculty. Successful participation is defined as consistently adhering to University requirements, as presented in this syllabus. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

Class Recordings

Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the Office of Student AccessAbility has approved the student to record the instruction, students are expressly prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those not in the class, or uploaded to other online environments except to implement an approved Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

“As a Comet, I pledge honesty, integrity, and service in all that I do.”

Student Resources

Students who have tested positive for COVID-19 or may have been exposed should not attend class in person and should instead follow required disclosure notifications as posted on the university's website (see "[What should I do if I become sick?](#)")

**** Do NOT come to class with cold or flu symptoms ****

COVID-19 Resources

[Comets United webpage](#): check frequently

[FAQ](#): check out the FAQs and reach out to your instructor or academic advisor if answers are not included

[Student Resources](#): a variety of resources are available to help students to obtain counseling, health care, and academic support.

Academic Support Resources

The information contained in the following link lists the University's academic support resources for all students.

Please see <http://go.utdallas.edu/academic-support-resources>.

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please review the catalog sections regarding the [credit/no credit](#) or [pass/fail](#) grading option and withdrawal from class.

Please go to <http://go.utdallas.edu/syllabus-policies> for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.