

BMEN 4313 Cellular Engineering

Fall 2026

Instructor: Dr. Clement Chan
Office: Discovery Park K240H
Class: NTDK K110, MoWe 10:40 am – 12:00 pm
Office Hours: MoWe, 12:00 pm to 1:00 pm
Email: tszyanclement.chan@unt.edu

Description: Cell-based technologies are emerging to support biomedical applications. By modifying DNA, RNA, proteins, and other biological components, bioengineers have created new cellular behaviors that can be harnessed for disease preventions, diagnostics, and treatments. To continue exploring the use of cell-based approaches for solving biomedical problems, bioengineers are required to gain a molecular understanding on cellular systems. In this course, we will learn about how biological pathways have been targeted for engineering new cellular functions, including transcription, translation, post-translational modification, and regulatory mechanisms for controlling these processes. Additionally, we will discuss a range of examples on using engineered cells as medical tools for therapies and diagnostics.

Communication Expectations: All course materials, announcements, and assignments will be available in the course Canvas website. Students are encouraged to email the instructor for any questions. Students may also make appointment to meet with the instructor during office hours.

Major Topics:

- Introduction to central dogma of gene expression
- Introduction to regulation of gene expression
- Transcription and transcriptional regulation
- Strategies to engineer transcriptional processes
- Translation and translational regulation
- Strategies of engineering translational processes
- CRISPR and other tools for genetic manipulation
- Development of genetic circuit for signal processing
- Cell therapy

- Group Project: Students will form groups to present research articles related to abovementioned topics

Textbook: Lecture notes are created based on this book: *Molecular Biology of the Gene (7th Edition)*, ISBN-13: 9780321762436, ISBN: 0321762436
Class notes and research articles will be provided to students as essential course materials.

Specific goals for the course: Upon successful completion of this course, students will gain a basic understanding of biological engineering. They will understand principles of physical and biochemical methods for quantifying changes in biological systems, and approaches to create desirable properties in organisms. They will also develop skills for analyzing biological data and ability to apply biological engineering design to generate new cellular functions and decision-making behaviors for solving biomedical problems.

Minimum Technology Requirements:

- Computer
- Microsoft Office Suite
- Canvas Technical Requirements
(<https://clear.unt.edu/supported-technologies/canvas/requirements>)

Computer Skills & Digital Literacy:

- Using Canvas
- Using email with attachments
- Downloading and installing software
- Using spreadsheet programs
- Using presentation and graphics programs

Technical Assistance:

Part of working in the online environment involves dealing with the inconveniences and frustration that can arise when technology breaks down or does not perform as expected. Here at UNT we have a Student Help Desk that you can contact for help with Canvas or other technology issues.

UIT Help Desk: UIT Student Help Desk site (<http://www.unt.edu/helpdesk/index.htm>)

Email: helpdesk@unt.edu

Phone: 940-565-2324

In Person: Sage Hall, Room 130

Walk-In Availability: 8am-9pm

Telephone Availability:

- Sunday: noon-midnight
- Monday-Thursday: 8am-midnight
- Friday: 8am-8pm

- Saturday: 9am-5pm

Laptop Checkout: 8am-7pm

For additional support, visit Canvas Technical Help

(<https://community.canvaslms.com/docs/DOC-10554-4212710328>)

Evaluation: Homework will be assigned in class. There will be one mid-term and one comprehensive final assignment during the semester. Each student will be required to work on a group presentation. The grading policy will be as follows:

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| • Homework (2-3 assignments) | 30% |
| • Group presentation | 20 % |
| • Quizzes | 30 % |
| • Final Assignment | 20 % |

Grading scale:

A – 90-100%

B – 80-89%

C – 70-79%

D – 60-69%

F - < 60%

This scale may be lowered at the instructor's discretion (but not raised).

Syllabus Change Policy:

Topics and assignments may be adjusted based on the progress of student learning. Canceling of any lectures will be announced on the Canvas website at least one week before the lecture date.

Policy Statements

A. Academic Integrity Standards and Consequences. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

B. ADA Accommodation Statement. UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website at disability.unt.edu.

C. Course Safety Procedures (for Laboratory Courses; this course does not consist of a laboratory session). Students enrolled in laboratory courses are required to use proper safety procedures and guidelines as outlined in UNT Policy 06.038 Safety in Instructional Activities. While working in laboratory sessions, students are expected and required to identify and use proper safety guidelines in all activities requiring lifting, climbing, walking on slippery surfaces, using equipment and tools, handling chemical solutions and hot and cold products. Students should be aware that the UNT is not liable for injuries incurred while students are participating in class activities. All students are encouraged to secure adequate insurance coverage in the event of accidental injury. Students who do not have insurance coverage should consider Standard Syllabus Statements Related Policy 06.049 Course Syllabi Requirements obtaining Student Health Insurance. Brochures for student insurance are available in the UNT Student Health and Wellness Center. Students who are injured during class activities may seek medical attention at the Student Health and Wellness Center at rates that are reduced compared to other medical facilities. If students have an insurance plan other than Student Health Insurance at UNT, they should be sure that the plan covers treatment at this facility. If students choose not to go to the UNT Student Health and Wellness Center, they may be transported to an emergency room at a local hospital. Students are responsible for expenses incurred there.

D. Emergency Notification & Procedures. UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Blackboard for contingency plans for covering course materials.