BMEN 4980 Cellular Engineering

BMEN 5800 Engineering of Cellular Systems

Fall 2020

Instructor: Dr. Clement Chan
Office: Discovery Park K240H
Class: Online with Zoom
Office Hours: Monday and Wednesday, 3:30 am to 4:50 pm
Email: tszyanclement.chan@unt.edu

Prerequisite: BMEN 3310

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.

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

Class notes and research articles will be provided to students as essential course materials.

**Specific goals for the course:**

Specific outcomes of instruction: 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.

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

- Homework 35%
- Midterm Exam 15%
- Final Exam 25%
- Group Presentation 25%

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).

**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.