BMEN 4980 Principles of Biomolecular Engineering

BMEN 5800 Biomolecular Engineering

Spring 2021

Instructor: Dr. Clement Chan

Office: Discovery Park K240H

Class: Online with Zoom (Monday and Wednesday, 5:30 am to 6:50 pm)

Office Hours: Monday and Wednesday, 4:00 am to 5:30 pm

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Prerequisite: BMEN 3310

Description: To engineer biological systems, it is essential to develop of biomolecular components with novel, desirable functions. These components include enzymes, structural proteins, receptors, and other macromolecules. Recent advances in biomolecular engineering open many new possibilities in protein design and protein construction. In this course, we will discuss a wide range of strategies in designing macromolecules, generating libraries of these parts, and screening desirable candidates. Additionally, this course aims to train students in reading, analyzing, and discussing materials from academic research articles.

Major Topics:

- Protein design based on biochemical and structural information
- Protein design with computational methods
- Strategies of constructing mutant libraries
- Screening methods: phage display
- Screening methods: cell surface display
- Screening methods: cell-free display
- Case study: engineering in vivo systems for site-directed unnatural amino acid incorporation
- Case study: rational design to modify ligand specificity in allosteric response
- Case study: computational design of ligand-binding protein
- Case study: coevolutionary model-based modulation of protein-protein interactions
Specific goals for the course:

Specific outcomes of instruction: Upon successful completion of this course, students will understand strategies of designing biological macromolecules. They will understand a range of broadly used approaches for modifying proteins and creating mutant libraries. They will also gain the knowledge of state-of-art methods for identify engineered components with desirable properties. Overall, they will develop skills to design experiments for biomolecular engineering.

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.