BIEN2610: Chemical Biology for Engineers (fall semester, 2023)

Course Instructor:
Prof. Becki Yi Kuang, Room 5578, Ext. 2617, email: kekuang@ust.hk

Course TA:

Time and Venue:
Lecture: Monday and Wednesday, Room 4475, 9:00 AM- 10:20 AM
Tutorial: Wednesday, Room 5508, 10:30 AM – 11:20 AM (Only before exam)
Office hour: Wednesday, Room 5578, 10:30 AM – 11:20 AM (By reservation)

Course Objectives:
This course will introduce the basic knowledge and application of nucleic acid/protein/ligand engineering; the utilization of chemical & biological modification of biomolecules for biomedical purposes; the development of omic techniques. Along the way, this course will review the principle and limitation of several advance diagnostic and therapeutic techniques in health care.

Reference Reading Materials:
Nucleic Acids in Chemistry and Biology, *by Blackburn et al.* (2006). PDF available online.
Principles of Biochemistry, *by Lehninger et al.* (2008). PDF available online.
Essentials Chemical Biology: *Structure and Dynamics of Biological Macromolecules, by Miller &Tanner.* (2007). PDF available online.

The lecture slides can be downloaded from the course website at Canvas.
There will be NO video recording of the lectures.

Evaluation:
40 min exam (3; choose top 2 out of 3) 60%
Written assignment (2 pages) 10%
In class exercise 15%
Participation (in class quiz) 15%
Bonus (1 point for 15 min appointment in office hour)

Exam 1 covers lecture 0-6
Exam 2 covers lecture 7-14
Exam 3 covers lecture 15-22
**There will be no makeup exam

Type of questions will be appeared in the exam:
1) *Multiple choices*
2) *Decide whether the statement is true/correct (√) or false/incorrect (x)*
3) *Fill in the blanks; matching*
4) *Short answer*

Course contents:

Nucleic acid & nucleic acid engineering		
Sept. 4 (Mon)	Lecture 0	Introduction of the course
Sept. 6 (Wed)	Lecture 1	Introduction of nucleic acid and gene
Sept. 11 (Mon)	Lecture 2	Basics of genetics and genomics
Sept. 13 (Wed)	Lecture 3	DNA mutation & damage repair
Sept. 18 (Mon)	Lecture 4	RNA processing & catalysis
Sept. 20 (Wed)	Lecture 5	Gene editing & DNA cloning
Sept. 25 (Mon)	Lecture 6	Engineering of artificial nucleic acid
Protein & protein engineering		
Oct. 27 (Wed)	Lecture 7	Introduction of amino acid & peptide
Oct. 04 (Wed)	Lecture 8	Basics of protein
Oct. 9 (Mon)*	*Exam 1*	
Oct. 11 (Wed)	Lecture 9	Enzyme & structural protein
Oct. 16 (Mon)	Lecture 10	Antigen & antibody; bioactive small peptide
Oct. 18 (Wed)	Lecture 11	Designing proteins for biological purposes I
Oct. 25 (Wed)	Lecture 12	Designing proteins for biological purposes II
	Topics of written assignment will be released on Canvas.	
Small biomolecules		
Oct. 30 (Mon)	Lecture 13	Metabolites & their use in health care
Nov. 1 (Wed)	Lecture 14	Ligand: important drug targets
The principle and application of bioengineering		
Nov. 6 (Mon)	Lecture 15	Combinatorial chemistry and molecular evolution
Nov. 8 (Wed)	Lecture 16	Labeling of biomolecules
Nov. 13 (Mon) *	*Exam 2*	
Nov. 15 (Wed)	Lecture 17	Tracking of biomolecules
Nov. 20 (Mon)	Lecture 18	Monitoring interactions between biomolecules
Nov. 22 (Wed)	Lecture 19	Sanger sequencing
Nov. 27 (Mon)	Lecture 20	Advanced sequencing
Nov. 29 (Wed)	Lecture 21	Protein separation and identification
	Upload written assignment onto Canvas.	
TBA *	*Exam 3*	