CHEM 5680 Advanced Chemical Biology

Course Description:

This course offers postgraduate students who are interested in the research at the interface between chemistry and biology in-depth knowledge about chemical biology. The course has three modules. Module 1 covers the chemical structures, reactions, synthesis, and functions of biomolecules. The lecturer will first introduce four types of biomolecules, namely peptides and proteins, lipids, carbohydrates, and nucleic acids to chemistry students, with a focus on their molecular structures, higher-order structures and organizations, and the organic reactions to synthesize or to transform these molecules in a synthetic laboratory or inside cells. The course will also focus on the functions that the structures and reactivities of the biomolecules encode. Enzymes, a special group of proteins will also be introduced to the audience, together with cofactors and coenzymes as one example of proteins possessing catalytic power. Module 2 will include current technologies developed in chemical biology, and selected research projects in this field, including literature review and guest lectures based on the knowledge delivered in the first two parts. Module 3 will be guest lectures in chemical biology. Through this course, students will be able to apply their chemistry knowledge to complicated biological molecules, to comprehend chemical biology research, and to identify/solve chemical biology problems.

Main Course Outline (for reference only):

1. Foundations of chemistry
2. Principles of organic chemistry
3. Carbonyl compounds
4. Amino acids, peptides and proteins
5. Chemical synthesis of peptides and proteins
6. Chemical modification of proteins\
7. Enzymes
8. Enzyme mimetics and inhibition
9. Carbohydrates
10. Catalytic antibodies and directed evolution
11. Chemical genetics