Course Objectives (Intended Learning Outcome):
After completion of the course, students are expected to be able to
1. Comprehend the knowledge, theories and principles of protein structure, functions, regulation and biological processes.
2. Describe the most up-to-date methods (including NMR, X-ray crystallography and Cryo-EM) utilized to characterize protein structures at atomic resolution.
3. Describe the history and scientific thinking behind the discoveries of biological principles and theories.
4. Utilize the strategies, ideas and methodologies used in current biological research.
5. Self-study biological topics related to proteins
6. Appreciate biological sciences and research

Course Contents:
First half (Dr. Zhe FENG)
I. Chemical and physical characterization of proteins
II. Chemical modification of proteins
III. Post-translational modification of proteins
IV. Forces that determine protein structures
V. Secondary and tertiary structures of proteins

Second half (Prof. Shangyu DANG)
I. Protein motif and domain
II. Protein structural determination (X-ray crystallography and Cryo-EM)
III. Tools to analyze protein sequence and structures
IV. Structural and function of membrane proteins
V. Protein and diseases

Course Topics and Schedule:
First Half (Dr. Zhe FENG) 1 Feb. – 15 Mar. 2020 (12 lectures to cover 7 topics in 5 areas)
I. Chemical and physical characterization of proteins
   Properties of amino acids, peptides, and proteins (Textbook Chapter 1)
   Working with proteins—purification and characterization of proteins

II. Chemical modification of proteins
   Methods and applications

III. Post-translational modification of proteins
   Structural and functional effects (Textbook Section 2.4)

IV. Forces that determine protein structures
   How to keep a protein folded properly (Textbook Chapter 4)

V. Secondary and tertiary structures of proteins
   Protein folding patterns (Textbook Chapter 5, 6.4)
   Protein modules

Midterm Exam: covers the lectures by Dr. Zhe FENG; counts as 50% of the course

Second Half (Prof. Shangyu DANG)  22 Mar. - 05 May 2020 (12 lectures to cover 9 topics in 5 areas)

I. Protein motif and domain
   Structure and function of protein motifs and domains

II. Protein structural determination (X-ray crystallography and Cryo-EM)
   X-ray crystallography (Textbook Chapter 10.1, 10.3)
   Resolution revolution of cryo-EM (Textbook Chapter 10.5)

III. Tools to analyze protein sequence and structures
   Protein sequence analysis (Textbook Chapter 6.3)
   Protein structural predication and application (Textbook Chapter 6.6)

IV. Structural and function of membrane proteins
   Physiological functions of membrane proteins (Textbook Chapter 5)
   Structural and mechanistic studies of membrane proteins

V. Protein and diseases
   Relationship of protein and diseases (Textbook Chapter 12)
   Structural based drug development

Final Exam: covers the lectures by Prof. Shangyu DANG; counts as 50% of the course