

國立清華大學課程大綱 Syllabus

科號 Course Number	5005	學分 Credit	1	人數限制 Class Size	20
中文名稱 Course Title	蛋白質物理二				
英文名稱 Course English Title	Protein Physics II				
任課教師 Instructor	竹村 和浩 (TAKEMURA, Kazhiro)				
上課時間 Time		上課教室 Room			

課程簡述(必填) (最多 500 個中文字) 本欄位資料會上傳教育部課程網

Brief Course Description (required) (50-200 words if possible, up to 1000 letters)

“Protein Physics I and II” will bring lectures on the physics of protein molecules, suitable for students who are willing to learn it from the beginning. Proteins are constituted from building blocks of amino acids and they are functional molecular machines, one of the essential components of the human body. The biophysical characteristics of proteins help us understand their structures, dynamics, and functions. This course will start with traits of amino acids and the conformation of the protein, followed by molecular interactions, thermodynamics, and statistical mechanics to understand the formation and stability of the secondary or higher-level structures. “Protein Physics II” is the follow-up course to “Protein Physics I,” it is advisable to either take “Protein Physics I” or read the first half of the textbook before enrolling in this class. Nevertheless, essential concepts from “Protein Physics I” will be briefly explained to ensure comprehension of the material covered in “Protein Physics II.”

請輸入課程內容「中文暨英文關鍵字」至少 5 個, 每個關鍵字至多 20 個中文, 以半形逗點分隔 (必填)

Please fill in at least 5 course keywords (up to 40 letters for each keyword) and use commas to separate them.(required)

amino acid, protein structure, protein function, secondary structure, tertiary structure, thermodynamics, statistical mechanics

課程大綱 Detailed Course Syllabus

● 課程說明(Course Description)

By the end of this course, students will be able to

- Explain the structure and function of proteins

- Explain interactions of proteins with their environments and effects on the structures
- Understand and explain the biophysics of proteins

“Protein Physics I” and “Protein Physics II” will bring lectures on the physics of protein molecules, suitable for students who are willing to learn it from the beginning. Proteins are constituted from building blocks of amino acids and they are functional molecular machines, one of the essential components of the human body. The biophysical characteristics of proteins help us understand their structures, dynamics, and functions. This course will start with traits of amino acids and the conformation of the protein, followed by molecular interactions, thermodynamics, and statistical mechanics to understand the formation and stability of the secondary or higher-level structures. “Protein Physics II” is the follow-up course to “Protein Physics I,” it is advisable to either take “Protein Physics I” or read the first half of the textbook before enrolling in this class. Nevertheless, essential concepts from “Protein Physics I” will be briefly explained to ensure comprehension of the material covered in “Protein Physics II.”

As the class prioritizes student comprehension, it may not cover all the planned content outlined in the syllabus

● 指定用書(Text Books)

Lecture notes will be given in the class

● 參考書籍(References)

Finkelstein, Alexei V.; Ptitsyn, Oleg. Protein Physics (Soft Condensed Matter, Complex Fluids and Biomaterials) . Elsevier Science.

● 教學方式(Teaching Method)

Lectures and discussion.

● 教學進度(Syllabus)

1. Course overview and review of “Protein Physics I”
2. α Protein
3. Protein Folds
4. Quasi-Random Sequence 1
5. Quasi-Random Sequence 2
6. Well-Folded Proteins and Intrinsically Disordered Proteins 1
7. Well-Folded Proteins and Intrinsically Disordered Proteins 2
8. Denaturation of Globular Proteins
9. Protein Folding in vivo and in vitro

10. Folding of Small Proteins
11. Free Energy Landscape of Folding
12. Protein Structure Prediction 1
13. Protein Structure Prediction 2
14. Protein function and protein structure 1
15. Protein function and protein structure 2
16. Combination of Elementary Interactions

成績考核(Evaluation)

Report (60%)

Participation including question and answer during class (40%)

- 可連結之網頁位址 相關網頁(Personal Website)

- Course policy for AI usage

<https://curricul.site.nthu.edu.tw/p/404-1208-248378.php?Lang=zh-tw>

This course adopts the following policy:

- Conditionally open - Students must briefly explain how generative AI was used for topic ideation, sentence refinement, or structural reference in the footnotes of the title page or after the reference in their assignments or reports. If usage is discovered without proper disclosure, instructors, the institution, or relevant units (e.g. our class) have the right to reevaluate the assignment or report or withhold scores.