

TIGP - CBMB

2023 Experimental Molecular Biophysics

實驗分子生物物理學

Time: 2:00 pm ~ 5:00 pm on Tuesdays

Place: R208 of the Institute of Biological Chemistry, Academia Sinica

Credit: 3 credits

Coordinator: Yun-Ru (Ruby) Chen

Instructors: Yun-Ru (Ruby) Chen 陳韻如 (GRC), Kuen-Phon Wu 吳昆峯 (IBC),

Su-Chang Lin 林世昌 (GRC), Wei-Hau Chang 章為皓 (IoC),

TA: upon the assignment for each module

Perspective:

The purpose of this class is to introduce different biophysical techniques and their possible applications. We will address how to combine different techniques in tackling specific biological issues. We will address how to combine different techniques in tackling specific biological issues.

Grading scheme:

25% for each module (Details will be announced at each module)

- ◆ Topic A: Spectroscopy and Solution Biophysics
- ◆ Topic B: NMR
- ◆ Topic C: Crystallography
- ◆ Topic D: CryoEM

Attendance:

Unexplained absence: **-3** of final grade

(did not send notice to the TA or the program secretary before class)

Late: **-1** of the final grade

Absence without supporting document: **-1** of final grade

(if a student did not inform the course TA or the program secretary, Ms. Vicki Huang (vicki0315@gate.sinica.edu.tw) to excuse him/herself from the class before lecture starts, he/she has to provide proof to Ms. Huang to explain his/her absence to the class.)

Schedule

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| Date | Topic A: Spectroscopy and Solution Biophysics This module is to lecture on general spectroscopy techniques for proteins and protein-protein interactions. The techniques to be covered include fluorescence, circular dichroism, infrared spectroscopy, surface plasmon resonance ...etc. Topics on protein folding and misfolding will be introduced. | Instructor |
| 2/14 | A1: Principle of spectroscopy and protein folding | Dr. Yun-Ru Ruby Chen |
| 2/21 | A2: Principle of solution biophysical techniques and protein misfolding | |
| 3/7 | A3: Hands-on experiments | |
| 3/14 | A4: Student Presentation | |
| Date | Topic B: NMR | Instructor |
| 3/21 | B1: The physical basics and biology <ul style="list-style-type: none"> ♦ Basics of NMR spectroscopy ♦ NMR biomolecules preparation ♦ Limitation of this technique | Dr. Kuen-Phon Wu |
| 3/28 | B2: The structure and interaction network <ul style="list-style-type: none"> ♦ Biomolecular structures determined by NMR ♦ NMR-based protein-protein or protein-ligand interactions | |
| 4/11 | B3: Data visualization and molecular viewer <ul style="list-style-type: none"> ♦ NMR data visualization ♦ PyMOL tutorial (computer needed) ♦ 2-3PM visit High Field NMR center | |
| 4/18 | B4: Presentation and visit NMR facility <ul style="list-style-type: none"> ♦ Discussion and presentation of provided NMR papers ♦ Visit NRBP NMR core facility and practice of data collection (2-3:30 PM) | |

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| | Topic C: Crystallography | |
| Date | This module is to lecture on the techniques for single-crystal X-ray diffraction and its applications and limitations. We will also use lysozyme as a model protein to go through the steps of protein crystallization, X-ray data collection and analysis | Instructor |
| 4/25 | C1: Protein crystallization Hands-on training: Hanging-drop protein crystallization | Dr. Su-Chang Lin |
| 5/9 | C2: Why X-ray crystallography? Hands-on training: Crystal mounting | |
| 5/16 | C3: Principle of X-ray diffraction Hands-on training: X-ray diffraction | |
| 6/20 | C4: Student presentation / Special Talk Hands-on training: Data analysis | |
| Date | Topic D: CryoEM | Instructor |
| 5/23 | D1: The basics of TEM and why electrons | Dr. Wei-Hau Chang |
| 5/30 | D2: The revolution: single particle, tomography and electron diffraction | |
| 6/6 | D3: Processing softwares: Principles and Practices | |
| 6/13 | D4: Issues on getting publishing cryo-EM paper. | |