**Advanced Chemical Biology** (Fall 2019)

**Professors:**

戴桓青 Bruce Tai hctai@ntu.edu.tw Department of Chemistry, NTU, Rm 477, (02) 3366-8682

朱忠瀚 John Chu johnchu@ntu.edu.tw Department of Chemistry, NTU, Rm 514, (02) 3366-8654

牟昀 Kurt Mou ymou@ibms.sinica.edu.tw Institute of Biomedical Sciences, Academia Sinica

**Teaching assistant:** Ushashi Bhattacharya, d07223205@ntu.edu.tw

**Classroom**: Chemistry 121

**Hours**: Mon. 13:30 – 15:10, Thu. 13:30 – 15:10

**Language:** Lectures, exams, and student presentations given in English

 **Students must answer exam questions in English**

**Grading:** Midterm exam 50%, class quizzes 10% (1st half)

Final exam 50%, Final presentation 20% (2nd half)

 **Presentation topic:** New frontiers in chemical biology (5 min. presentation graded by other classmates)

**Prerequisite:**

Everyone enrolled in this class should have taken undergraduate level biochemistry. Some background information from basic biochemistry will be provided in the lectures. Undergraduate students can enroll only if they have already taken (and passed) biochemistry.

**Online material:**

PowerPoint slides will be uploaded to CEIBA (ceiba.ntu.edu.tw) course website one day before each lecture. Assigned reading materials will be uploaded to CEIBA 3 days before each lecture.

Course Syllabus (check CEIBA website for updates)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Date** | **Day** | **Topic** | **Note**  |
| 1 | 9/9 | Mon | Course introduction + the philosophy of science |  |
| 2 | 9/12 | Thu | What is chemical biology? |  |
| 3 | 9/16 | Mon | Nucleic acid structure and DNA mimetics |  |
| 4 | 9/19 | Thu | **Guest Lecture: CRISPR and CAR-T technologies** | **Kurt Mou** |
| 5 | 9/23 | Mon | DNA sequencing technologies |  |
| 6 | 9/26 | Thu | RNA and RNA interference |  |
| 7 | 9/30 | Mon | Ribozymes and aptamers |  |
| 8 | 10/3 | Thu | Protein synthesis and degradation |  |
| 9 | 10/7 | Mon | Incorporation of noncanonical amino acids into proteins |  |
| 10 | 10/10 | Thu | No class | National Day |
| 11 | 10/14 | Mon | Protein folding |  |
| 12 | 10/17 | Thu | Structure, biosynthesis, and functions of carbohydrates  |  |
| 13 | 10/21 | Mon | Structure, biosynthesis, and functions of lipids |  |
| **14** | **10/24** | **Thu** | **Guest Lecture: CAR-T technology** | **Kurt Mou** |
| 15 | 10/28 | Mon | Natural products |  |
| 16 | 10/31 | Thu | Synthetic molecular sensors |  |
| **17** | **11/4** | **Mon** | **No class** |  |
| 18 | 11/7 | Thu | **Mid-term exam**  |  |
| 19 | 11/11 | Mon | Antibody and biotin technology |  |
| 20 | 11/14 | Thu | Bioorthogonal Chemistry |  |
| 21 | 11/18 | Mon | Useful databases for chemical biology |  |
| 22 | 11/21 | Thu | Biomolecule separation |  |
| 23 | 11/25 | Mon | Electron microscopy |  |
| 24 | 11/28 | Thu | Fluorescent dyes and proteins |  |
| 25 | 12/2 | Mon | Optical microscopy |  |
| 26 | 12/5 | Thu | Super-resolution fluorescence imaging |  |
| 27 | 12/9 | Mon | Mass spec instrumentation |  |
| 28 | 12/12 | Thu | Protein sequencing by mass spec  |  |
| 29 | 12/16 | Mon | Protein quantification |  |
| 30 | 12/19 | Thu | Protein misfolding disorders |   |
| 31 | 12/23 | Mon | Bioanlytical chemistry of museum objects |  |
| 32 | 12/26 | Thu | **Student presentation** |  |
| 33 | 12/30 | Mon | **Student presentation** |  |
| 34 | 1/2 | Thu  | **Student presentation** |  |
| **35** | **1/9** | **Thu** | **Final exam** |  |