**CHEM 570 Concepts in Chemical Biology**

**Basic Information**

**Number of credits**: 4

**Term and year**: Fall 2017

**Instructor**: Jeff Chan

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**Office hours**: By appointment via e-mail

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**Teaching Assistant:** Aya Kelly

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**Description**

An overview of the concepts and methods utilized in research at the interface of chemistry and biology, and their application to contemporary problems in biological chemistry. Specific topics covered include, but are not limited to, chemical genetics, bioconjugation reactions, combinatorial chemistry, high-throughput screening, identifying biological targets of small-molecule compounds, combinatorial biosynthesis, sequence-specific DNA-binding compounds, activity-based protein profiling, anti-cancer agents, targeted therapeutics, phage display, and yeast-hybrid systems.

Prerequisite: One year (two semesters) of undergraduate organic chemistry is required. One semester of undergraduate biochemistry or molecular biology is preferred.

For graduate students only. Well-qualified undergraduate students may enroll with consent of instructor.

**Course Schedule (Lectures are subject to change)**

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| **Lecture** | **Date** | **Topic** |
| 1 | August 29 | Biochemical basics |
| 2 | August 31 | Cell biology basics |
| 3 | Sep 5 | Analysis of DNA, RNA, protein levels |
| 4 | Sept 7 | Model organisms, genetic knockouts, RNAi, and chemical genetics |
| 5 | Sept 12 | Fluorescence applications |
| 6 | Sept 14 | Molecular Imaging probes |
| 7 | Sept 19 | Biomolecular interactions and bioconjugation |
| 8 | Sept 21 | Combinatorial chemistry |
| 9 | Sept 26 | Target identification |
| 10 | Sept 28 | High-throughput compound screening |
| 11 | Oct 3 | Unnatural amino acid incorporation |
| Midterm 1 | Oct 5 |  |
| 12 | Oct 10 | Combinatorial biosynthesis |
| 13 | Oct 12 | Sequence-specific DNA binders |
| 14 | Oct 17 | Activity-based protein profiling |
| 15 | Oct 19 | Molecular basis of cancer and anti-cancer agents |
| 16 | Oct 24 | Structure-based design  |
| 17 | Oct 26 | Stem cells and regenerative medicine |
| 18 | Oct 31 | Phase display and yeast hybrid systems / Riboswitches |
| 19 | Nov 2 | Chemical probes for kinases and phosphatases |
| 20 | Nov 7 | Tools to study glycosylation |
| Midterm 2 | Nov 9 |  |
| 21 | Nov 14 | Student proposal presentations |
| 22 | Nov 16 | Student proposal presentations |
| 23 | Nov 28 | Student proposal presentations |
| 24 | Nov 30 | Student proposal presentations |
| 25 | Dec 5 | Student proposal presentations |
| 26 | Dec 7 | Final exam review session |

**Evaluation Procedures and Grading Criteria**

Student-led discussion 5%

Midterm 1 20%

Midterm 2 20%

Proposal 25%

Final exam 30%

**Web Pages**

**https://www.chan-lab.com/chem-570**

Class notes will be available for download the day before lecture by 8:00 pm.

Syllabi presented on web pages shall contain the date of last update.