Course Syllabus – CHEM 450

Course Information

Course Number: CHEM 450 SP24
Course Name: Physical Organic Chemistry - Kinetics
Term: SP 2024
Start Date: 04/02/2024
End Date: 06/21/2024
Credits: 3.0

Meeting Days / Times

Tuesdays and Thursdays, 10:15-11:45am PT / 1:15-2:45pm ET
(See Calendar in Canvas for the most up-to-date schedule.)

Locations

CA: Graduate Office Dining Room (Hazen Theory Building)
FL: B214

Course Managers

Role	Last Name	First Name	Email Address
Course Director	Blackmond	Donna	blackmon@scripps.edu
TA	Yu	Jinhan	jinhanyu@scripps.edu

Course Description

The course covers selected special topics pertinent to current research in physical organic chemistry with an emphasis on kinetics and mechanisms of catalytic reactions. Lectures are accompanied by examples from the current literature as well as case studies significant to the historical development of the field. Problem solving is required throughout. The course is a useful companion to specialized classes in chemical synthesis, organometallic chemistry, and physical chemistry.

Program Learning Outcomes

By the end of the program, students will have accomplished these objectives:
PLO1: Original Research – graduate students are expected to develop the skills critical for generating high-quality research output. This would include absorbing, recalling, and

contextualizing scientific knowledge, evaluating scientific information and data, creating testable hypotheses and investigating hypotheses, mastering scientific tools and techniques, displaying ethical behavior, and receiving and giving feedback.
PLO2: Communication – graduate students are expected to demonstrate the oral, written, and media skills to effectively communicate the impact of a study or a body of work to the greater scientific community and to the public at large using a number of methods.
PLO3: Critical Thinking – graduate students are expected to develop a self-directed process to analyze information, form opinions or judgments, and use this process to improve the quality of their scientific thoughts, navigate problems, and make informed decisions.
PLO4: Intellectual Curiosity – graduate students are expected to acquire the capacity to build their intellectual curiosity and demonstrate problem solving approaches that serve their professional growth and ability to impact a field.
PLO5: Career and Professional Development – graduate students are expected to develop a variety of transferable skillsets throughout their graduate experience, including management and leadership, inclusiveness, resilience, scientific rigor, collaboration, accountability, time management, teamwork, networking, and career planning.

For a detailed description of each outcome and specific success indicators, please refer to this web page: https://education.scripps.edu/graduate/doctoral-program/.

Course Learning Outcomes

Upon completion of this course students will be able to:
CLO1: Understand the factors that contribute to observed chemical kinetics from a molecular perspective.
CLO2: Predict experimental rate equations from proposed mechanisms, and create and evaluate mechanistic proposals from experimental kinetic observations.
CLO3: Propose reasonable explanations for observed reactions.
CLO4: Propose informative and incisive experimental tests to distinguish between mechanistic proposals.
CLO5: Be familiar with chemical and physical models to rationalize the emergence of biological homochirality.
CLO6: Understand how to evaluate the advantages and disadvantages of carrying out organic reactions in flask vs flow operation.

Background Preparation (Prerequisites)

Satisfactory completion of an undergraduate course in organic chemistry is required, but previous exposure to physical organic chemistry is not. Papers will occasionally be assigned for reading in preparation for a class or as a follow-up: reading of these materials is required. Students are strongly encouraged to review background material relevant to each class; sources will be provided at the beginning of each topic.

Course Materials

Useful to Consult: Carpenter (1984). *Determination of Organic Reaction Mechanisms*. ISBN: 978-0471893691.
Useful to Consult: Lowry & Richardson (1987). *Mechanism and Theory in Organic Chemistry*. ISBN: 978-0060440848.
Useful to Consult: Anslyn & Dougherty (2005). *Modern Physical Organic Chemistry*. ISBN: 978-1891389313.

Attendance Statement

Students are expected to attend all classes. Students who are unable to attend class must seek permission for an excused absence from the course director or teaching assistant. Unapproved absences or late attendance for three or more classes may result in a lower grade or an "incomplete" for the course. If a student has to miss a class, he or she should arrange to get notes from a fellow student and is strongly encouraged to meet with the teaching assistant to obtain the missed material.

Scientific and Professional Ethics

The work you do in this course must be your own. Feel free to build on, react to, criticize, and analyze the ideas of others but, when you do, make it known whose ideas you are working with. You must explicitly acknowledge when your work builds on someone else's ideas, including ideas of classmates, professors, and authors you read. If you ever have questions about drawing the line between others' work and your own, ask the course professor who will give you clear guidance. Exams must be completed independently. Any collaboration on answers to exams, unless expressly permitted, may result in an automatic failing grade and possible expulsion from the Graduate Program.

Technology Requirements and Support

For issues related to Canvas, please contact the Graduate Office by email at: gradprgm@scripps.edu or by phone at: 858-784-8469.

Course Grading

Grading is in accordance with the academic policies of the Skaggs Graduate School. The breakdown of grading is as follows:

- Midterm Exam**:** 20%
- Final Exam**:** 20%
- In-Class Quizzes: 30%
- Class Presentations: 30%

Letter Grade	Percent	GPA	Description
A	93-100	4.00	Outstanding achievement. Student performance demonstrates full command of the course subject matter and evinces a high level of originality and/or creativity that far surpasses course expectations.
A-	90-92	3.67	Excellent achievement. Student performance demonstrates thorough knowledge of the course subject matter and exceeds course expectations by completing all requirements in a superior manner.
B+	87-89	3.33	Very good work. Student performance demonstrates above-average comprehension of the course subject matter and exceeds course expectations on all tasks as defined in the course syllabus. There is notable insight and originality.
B	83-86	3.00	Satisfactory work. Student performance meets designated course expectations and demonstrates understanding of the course subject matter at an acceptable level.
B-	80-82	2.67	Marginal work. Student performance demonstrates incomplete understanding of course subject matter. There is limited perception and originality.
C+	77-79	2.33	Unsatisfactory work. Student performance demonstrates incomplete and inadequate understanding of course subject matter. There is severely limited or no perception or originality. Course will not count toward degree.
C	73-76	2.00	Unsatisfactory work. Student performance demonstrates incomplete and inadequate understanding of course subject matter. There is severely limited or no perception or originality. Course will not count toward degree.
P	73-100	0.00	Satisfactory work. Student performance demonstrated complete and adequate understanding of course subject matter. Course will count toward degree.
F	0-72	0.00	Unacceptable work/Failure. Student performance is unacceptably low level of knowledge and understanding of course subject matter. Course will not count toward degree. Student may continue in program only with permission of the Dean.

I	0.00	Incomplete is assigned when work is of passing quality but is incomplete for a pre-approved reason. Once an incomplete grade is assigned, it remains on student's permanent record until a grade is awarded.
W	0.00	Withdrew from the course with Dean's permission beyond the second week of the term.

- All courses will be recorded and maintained in the student's permanent academic record; only courses that apply towards the degree will appear on the academic transcript. Non-credit or audited courses will not appear on the transcript.
- 4 core courses taken for a letter grade (pass = B- or higher for a core course)
- 2 elective courses taken pass/fail (pass = A, B, C for an elective)

Course Summary

Date	Details
Tue Apr 2, 2024	Introduction to Catalytic Reaction Kinetics (Blackmond)
Thu Apr 4, 2024	Introduction to Catalytic Reaction Kinetics continued (Blackmond)
Tue Apr 9, 2024	Asymmetric Catalytic Hydrogenation (Blackmond)
Thu Apr 11, 2024	Mass Transfer/Stirring Speed/Pressure Effects in Hydrogenation (Blackmond)
Tue Apr 16, 2024	Reaction Progress Kinetic Analysis (Blackmond)
Thu Apr 18, 2024	RPKA continued (Blackmond)
Tue Apr 23, 2024	Heterogeneous Catalysis (Blackmond)
Thu Apr 25, 2024	Reactions in Flow (Blackmond)
Tue Apr 30, 2024	Reactions in Flow (Blackmond)
Thu May 2, 2024	Reactions in Flow (Blackmond)
Tue May 7, 2024	COPASI (Blackmond)
Thu May 9, 2024	COPASI cont'd (Blackmond)
Tue May 14, 2024	Kinetic Isotope Effects (Blackmond)
Thu May 16, 2024	Nonlinear Effects in Asymmetric Synthesis, Catalysis, & Autocatalysis (Blackmond)
Fri May 17, 2024	Commencement
Tue May 21, 2024	The Principle of Microscopic Reversibility (Blackmond)
Thu May 23, 2024	Modeling in Asymmetric Catalysis (Blackmond)
Mon May 27, 2024	No Class (Memorial Day)
Wed Jun 19, 2024	No Class (Juneteenth)