Course Syllabus – CHEM 460

Course Information

Course Number: CHEM 460 FA25
Course Name: Physical Organic Chemistry - Bonding and Reactivity
Term: FA 2025
Start Date: 09/03/2025
End Date: 12/05/2025
Credits: 3.0

Meeting Days / Times

Mondays and Wednesdays, 11:00am-12:30pm PT / 2:00-3:30pm ET
(See Calendar in Canvas for the most up-to-date schedule.)

Location
CA: Keck Amphitheater *(Exception: **Sept 22 & Nov 19** - Seminar Room, Hazen Theory Bldg.)*
FL: A212

Course Managers

Role	Last Name	First Name	Email Address
Course Director	Diercks	Christian	cdiercks@scripps.edu
TA	Lisboa	Al	alisboa@scripps.edu
TA	Zong	Kevin	kzong@scripps.edu

Course Description

The course covers selected special topics pertinent to current research in physical organic chemistry with an emphasis on bonding and reactivity. Topics include molecular structure and thermodynamics, intermolecular forces, reactivity and mechanisms, stereochemistry and electronic structure. Lectures are accompanied by examples from the current literature as well as case studies significant to the historical development of the field. The course is a useful companion to specialized classes in chemical synthesis, organometallic chemistry, and bio-organic 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.

Course Learning Outcomes

Upon completion of this course students will be able to:
CLO1: Understand the detailed structure of a molecule.
CLO2: Identify a molecule's hot spots with respect to reactivity (factors include sites of acidity, electronegativity, polarizability, atomic and molecular orbital character and strain).
CLO3: Evaluate the contribution of these factors to a molecule's energetics, noncovalent interactions and reaction mechanisms.

Background Preparation (Prerequisites)

Satisfactory completion of an undergraduate course in organic chemistry is required, but previous exposure to physical organic chemistry is not.

Course Materials

Required: 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:

- Each of the three exams constitutes one third of the final grade.

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)

Because students are encouraged to take electives outside their area of expertise, a "C" letter grade is passing.

Course Summary

Date	Details
Mon Sep 1, 2025	Labor Day (No Class)
Wed Sep 3, 2025	Structure and Bonding (Diercks)
Mon Sep 8, 2025	Structure and Bonding (Diercks)
Wed Sep 10, 2025	Strain and Stability I (Diercks)
Mon Sep 15, 2025	Introduction to Catalytic Reaction Kinetics I (Blackmond)
Wed Sep 17, 2025	Introduction to Catalytic Reaction Kinetics II (Blackmond)
Mon Sep 22, 2025	Supramolecular and Dynamic Covalent Chemistry (Diercks) CA LOCATION: SEMINAR ROOM
Wed Sep 24, 2025	Exam #1
Mon Sep 29, 2025	Exam Review (TA)
Wed Oct 1, 2025	Acid Base Chemistry (Diercks)
Mon Oct 6, 2025	Stereochemistry I (Diercks)
Wed Oct 8, 2025	Stereochemistry II (Diercks)
Mon Oct 13, 2025	Energy Surfaces and Kinetic Analysis (Diercks)
Wed Oct 15, 2025	Linear Free Energy Relationships (Diercks)
Mon Oct 20, 2025	Catalysis (Diercks)
Wed Oct 22, 2025	Exam #2
Mon Oct 27, 2025	Exam Review (TA)
Wed Oct 29, 2025	Molecular Orbital Theory (Diercks)
Mon Nov 3, 2025	Thermal Pericyclic Reactions (Diercks)
Wed Nov 5, 2025	Electrochemistry (Yu Kawamata)
Mon Nov 10, 2025	Photochemistry (Mario Wiesenfeldt)
Wed Nov 12, 2025	Electronic Organic Materials (Diercks)
Mon Nov 17, 2025	Exam #3
Wed Nov 19, 2025	Exam Review (TA) CA LOCATION: SEMINAR ROOM