

**CHEMISTRY 599 SPECIAL TOPICS  
KINETICS AND MECHANISM OF CATALYTIC REACTIONSS  
FALL SEMESTER 2023**

<b>INSTRUCTOR</b>	<p>Prof. Valery V. Fokin MCB-359 (213) 740-5964 <a href="mailto:fokin@usc.edu">fokin@usc.edu</a></p> <p>Office Hours: by appointment</p> <p>Dr. Dmitry Eremin <a href="mailto:eremin@usc.edu">eremin@usc.edu</a></p>
<b>PREREQUISITES</b>	CHEM 526, can be taken concurrently.
<b>LECTURE</b>	Tentatively Tue and Thu, 2-3:20 pm. Location will be announced.
<b>COURSE CONTENT AND LEARNING OBJECTIVES</b>	<p>This course is designed to introduce the students to the important physical organic chemistry aspects of catalytic reactions and processes. We will initially focus on metal-catalyzed transformations as they offer many variables for optimization and, as a consequence, represent complex multicomponent systems with unique challenges. Using examples from literature, we will learn about methods of interrogation of reaction mechanism, the importance of obtaining robust data and methods for its processing. We will also examine applications of catalytic processes in industrial and research settings. Among the techniques for interrogation of these complex systems, we will examine modern mass spectrometry. The students will have an opportunity for several hands-on sessions on high-end MS instruments at the Chemistry Department and Agilent Center of Excellence in Biomolecular Characterization.</p>
<b>ACADEMIC INTEGRITY</b>	<p>All USC students are responsible for reading and following the Student Conduct Code, which appears in the SCampus and at <a href="https://policy.usc.edu/student/scampus/">https://policy.usc.edu/student/scampus/</a></p> <p>The USC Student Conduct Code prohibits plagiarism. Some examples of what is not allowed by the conduct code: copying all or part of someone else's work (by hand or by looking at others' files, either secretly or if shown), and submitting it as your own; giving another student in the class a copy of your assignment solution; consulting with another student during an exam; modifying a graded assignment before asking for re-grading, letting your lab partner prepare the report and expect</p>

	<p>a grade for their work. If you have questions about what is allowed, please discuss it with the instructor.</p> <p>Students who violate University standards of academic integrity are subject to disciplinary sanctions, including failure in the course and suspension from the University. Since dishonesty in any form harms the individual, other students, and the University, policies on academic integrity will be strictly enforced. We expect you to familiarize yourself with the Academic Integrity guidelines found in the current Scampus. Violations of the Student Conduct Code will be filed with the Office of Student Conduct, and appropriate sanctions will be given.</p> <p>This policy does not apply to discussion, exchange of information, working together, etc. On the contrary, we encourage that you consult with classmates regarding learning material and homework assignments. Team projects require that you work with your team and assist your partner as much as he or she assists you. However, for individual marks, it is required that you prepare the final product by yourself.</p>
<b>TEXTS</b>	Primary literature and/or links to it will be provided before starting a new topic.

<b>GRADING</b>	<p>The course will be graded on the basis of</p> <p>Homework 1 (50 points),          Lab report 1 (50 points),          Lab report 2 (50 points),          Homework 2 (50 points),          Critical Review (75 points),          Final assignment (125 points), due on December 8 (Friday).</p> <p><b>Total 400 points</b></p>
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### Tentative schedule

DATE	TOPIC	ITEMS DUE
Weeks 1-2	Introduction to multistep reactions, catalysis, mechanism and kinetics.	
Weeks 3-4	Thermodynamics and kinetics. Rate laws and their meaning.	
Weeks 5-6	Mechanistic investigation of multistep processes.	
Weeks 7-8	Linear free energy relationships. Hammett plots and Hammond postulate.	<b>Homework 1</b>
Weeks 9	Examples of studies of homogeneous catalytic processes.	
Week 10	Mass spectrometry: theoretical aspects and general principles.	
Week 11	Ionization technics: from small molecules to tissue analysis.	
Week 12	Practical classes: Familiarization with modern instruments.	
Week 13	Mass spectra interpretation. Fragmentation principles. Structure elucidation.	<b>Homework 2</b>

Week 14	Mass spectrometry of biomolecules. Peptide sequencing.	
Week 15	Presentations and discussion of final projects.	<b>Critical Review, Lab 1 and Lab 2, Final Assignment</b>

### Grading breakdown

Assignment	Points	% of grade
Homework 1	50	12.5
Lab report 1	50	12.5
Lab report 2	50	12.5
Homework 2	50	12.5
Critical Review	75	18.75
Final assignment	125	31.25
<b>Total</b>	<b>400</b>	<b>100</b>

## Statement on Academic Conduct and Support Systems

### Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, “Behavior Violating University Standards” [policy.usc.edu/scampus-part-b](http://policy.usc.edu/scampus-part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

### Support Systems:

*Student Counseling Services (SCS)* – (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. [engemannshc.usc.edu/counseling](http://engemannshc.usc.edu/counseling)

*National Suicide Prevention Lifeline* – 1 (800) 273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. [www.suicidepreventionlifeline.org](http://www.suicidepreventionlifeline.org)

*Relationship and Sexual Violence Prevention Services (RSVP)* – (213) 740-4900 – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. [engemannshc.usc.edu/rsvp](http://engemannshc.usc.edu/rsvp)

*Sexual Assault Resource Center*

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: [sarc.usc.edu](http://sarc.usc.edu)

*Office of Equity and Diversity (OED)/Title IX Compliance* – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class. [equity.usc.edu](http://equity.usc.edu)

*Bias Assessment Response and Support*

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. [studentaffairs.usc.edu/bias-assessment-response-support](http://studentaffairs.usc.edu/bias-assessment-response-support)

*The Office of Disability Services and Programs*

Provides certification for students with disabilities and helps arrange relevant accommodations. [dsp.usc.edu](http://dsp.usc.edu)

*Student Support and Advocacy – (213) 821-4710*

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. [studentaffairs.usc.edu/ssa](http://studentaffairs.usc.edu/ssa)

*Diversity at USC*

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. [diversity.usc.edu](http://diversity.usc.edu)

*USC Emergency Information*

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. [emergency.usc.edu](http://emergency.usc.edu)

*USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.*

Provides overall safety to USC community. [dps.usc.edu](http://dps.usc.edu)