Surface Chemistry and Heterogeneous Processes (CHEM:5438)  
Spring 2019

Instructor: Prof. Alexei V. Tivanski  
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Office Hours in E272 CB: TW 2:00-3:30 PM, or by appointment  
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Department of Chemistry Contact Information: Students in need of additional information may contact staff in the Chemistry Center (231 CB or phone: 335-1341) during normal business hours.

Lectures: TTh 11:00 AM -12:15 PM E224 CB; attendance is expected

Course Materials: Course Website: CHEM:5438– Iowa Courses Online: https://icon.uiowa.edu/

Required Textbook: Surface Science: Foundations of Catalysis and Nanoscience, 3rd Edition by Kurt W. Kolasinski
Suggested Textbook: Physical Chemistry 11th Ed. by P. A. Atkins and J. de Paula (previous versions and/or other Physical Chemistry textbooks are good alternative)

Objectives: This course is intended as an introduction to surface chemistry and an overview of methods for the characterization of surfaces. We will cover fundamental and applied aspects of surface chemical processes; theories of molecular adsorption/desorption and surface complexation; kinetics; surface analysis and instrumentation; applications of surface chemistry in heterogeneous catalysis, heterogeneous environmental/atmospheric processes, nanoscience and materials chemistry.

Exams: There will be two in-class exams of equal weight (125 points each), each covering approximately half of the material. You will be allowed to use lecture notes & handouts, but NOT a textbook. The days of the exams will be announced in advance during lectures and posted on the ICON web site. Note that the time limit for taking each in-class exam is 1 hour 15 minutes. There will be NO final exam during examination week. Make-up exams will be given only for excused absences or documented medical reasons. Please contact Prof. Tivanski before the missed exam.

Homework: Two graded homework assignments (50 points each) will be given during the course of the semester. Homework are encouraged to be discussed and worked in collaboration, but all written work must be performed independently. Note: homework assignments must be submitted in class, late assignments will not be accepted.

Literature Review Presentation: Each student will make one brief (50 points), approximately 15 minutes presentation (including time for questions) presentation to the class using slides to discuss a scientific paper related to the course material. Each student will need to confirm their paper choice with the instructor. Presentations will be scheduled towards the last third of the semester.

Final Project Report: The final project report (100 points) will consist of a brief (five pages not counting figures/references, Times New Roman font size 12, 1.5 spaced) written document on a topic relevant to Surface Chemistry and Heterogeneous Processes course. Project topics will be
selected by each student and will need to be confirmed with the instructor. The report must be based on at least 3 papers that are used as primary reference. The final project report will be due no later than 11:59 PM on Wednesday of the finals examination week and should be submitted via email to the instructor. Please note that late reports will not be accepted.

**Grading and Grading Criteria:** Plus & minus grades will be awarded.

The homework, exams, presentation and final project will be weighted in the following manner:

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<thead>
<tr>
<th>Component</th>
<th>Points</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>2 homework assignments</td>
<td>100</td>
<td>20%</td>
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<tr>
<td>2 in class exams</td>
<td>250</td>
<td>50%</td>
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<tr>
<td>1 in class presentation</td>
<td>50</td>
<td>10%</td>
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<tr>
<td>1 final project report</td>
<td>100</td>
<td>20%</td>
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<tr>
<td><strong>Total</strong></td>
<td>500</td>
<td>100%</td>
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**Tentative topics to be discussed:**

1. Introduction to Surface Chemistry
2. Adsorption
3. Desorption
4. Structure of Solid Surfaces
5. Electronic Properties of Extended Structures
6. Surface Analysis: Techniques and Methods
7. Chemical Bonding at Surfaces
8. Chemical Reactions at Surfaces
9. Catalysis
10. Nanoscience and Nanotechnology
11. Heterogeneous Processes in Atmospheric and Environmental Chemistry
12. Interfaces: Material and Biological Surfaces
Policies:

CLAS Policies and Procedures: Administrative Home: The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS Academic Policies Handbook at http://clas.uiowa.edu/students/handbook.

Electronic Communication: University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondences (Operations Manual, III.15.2,k.11).

Accommodations for Disabilities: A student seeking academic accommodations should first register with Student Disability Services and then meet privately with the course instructor to make particular arrangements. See www.uiowa.edu/~sds/ for more information.

Academic Honesty: All CLAS students or students taking classes offered by CLAS have, in essence, agreed to the College’s Code of Academic Honesty: ”I pledge to do my own academic work and to excel to the best of my abilities, upholding the IOWA Challenge. I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty.” Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled (CLAS Academic Policies Handbook).

CLAS Final Examination Policies: The final examination schedule for each class is announced by the Registrar generally by the tenth day of classes. Final exams are offered only during the official final examination period. No exams of any kind are allowed during the last week of classes. All students should plan on being at the UI through the final examination period. Once the Registrar has announced the date, time, and location of each final exam, the complete schedule will be published on the Registrar’s web site and will be shared with instructors and students. It is the student’s responsibility to know the date, time, and place of a final exam.

Making a Suggestion or a Complaint: Students with a suggestion or complaint should first visit with the instructor (and the course supervisor), and then with the departmental DEO. Complaints must be made within six months of the incident (CLAS Academic Policies Handbook).

Understanding Sexual Harassment: Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI Comprehensive Guide on Sexual Harassment for assistance, definitions, and the full University policy.

Reacting Safely to Severe Weather: In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Department of Public Safety website.