

ChEE\Chemistry\MSE 437-537 Syllabus

Prerequisites

Junior or senior undergraduate or graduate student standing in chemistry, physics, optical sciences, or engineering.

Objectives

The purpose of this course is to gain a fundamental understanding of the surface chemistry of solids. This will be done through the lens of nanotechnology because fabrication of many of the building blocks and implementation of the methods depend on the chemistry and physics at the solid interface. We will touch upon sensors, catalysis, and medical diagnostics as well as other applications. Successful completion of this course will allow you to:

1. Recognize, understand, and employ the technical terminology used in surface science.
2. Understand the basic physical and chemical properties of solid surfaces.
3. Analyze how size, shape, surfaces, defects, and directed self-assembly form the basis of nanofabrication techniques.
4. Design devices using nanofabrication methods to meet new technical challenges.
5. Identify and understand systematic trends in the reactivity of solid surfaces.

Instructor

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Course web address: D2L	

Time

Lecture (days/times TBD)	Room TBD
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Textbook

Concepts of Nanochemistry, Ludovico Cademartiri and Geoffrey A. Ozin (Wiley-VCH, 2009), ISBN: 978-3527325979 (paper). This a wonderful book to learn from because of the passion that the authors bring to the material.

Topics

Surface science concepts will be illustrated using the synthesis, characterization, and properties of semiconductor quantum dots and larger structures made using quantum dots. The concepts include surface structure, reactivity, and electronic structure. We will switch gears about two-thirds of the way through and discuss a more traditional surface science topic, namely heterogeneous catalysis. There we will learn about adsorption, chemical reactions on solid metal surfaces, and desorption, including surface reaction mechanisms.

Course Grade

Homework	25%
Exam 1	25%
Exam 2	25%
Final exam or project*	25%

*The final exam for all graduate students is completion of a project in which they research and design a device to perform a function (sensor, logic computation, information storage, drug delivery, environmental filter, etc.) and show the details of how to build it with some of the techniques discussed in the course. The project output is a short report and a presentation to the class on their device.

Homework Guidelines

The material in this course is drawn from several different areas so half the battle is often defining a reasonable approach to solve a problem. Always state assumptions clearly and justify use of an equation or concept when not obvious. Provide sufficient detail that an educated reader can follow your method and strive to write concisely.

Course Policies

Homework assignments are due at the beginning of class on the date specified on the problem set. No late homework will be accepted unless prior permission is obtained from the instructor. Medical conditions and other circumstances beyond your control will be considered on an individual basis. Interview trips, conferences, and other scheduled activities are within your control.

Academic Integrity

This class encourages and requires collaboration, but individual work assignments will be given that are designed with a specific purpose in mind. Individual assignments will be clearly identified or are standard in the case of the final exam. Do not copy someone else's work. Do not work jointly on individual assignments. This behavior defeats part of the rationale of the class and will result in a score of 0 for everyone involved. UA policies can be found at <http://deanofstudents.arizona.edu/codeofacademicintegrity>.

Accessibility and Accommodations

It is the University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact Disability Resources (520-621-3268) to establish reasonable accommodations.

Absence policies

All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion.

Absences pre-approved by the UA Dean of Students (or Deans designee) will be honored.

Policy on Threatening Behavior

The University seeks to promote a safe environment where students and employees may participate in the educational process without compromising their health, safety or welfare. UA policies can be found at <http://policy.web.arizona.edu/threatening-behavior-students>.