

Class Meetings: Tues. Thurs. 3:10 – 4:25 Fulmer 124.

Important Contact Information:

<u>Instructors:</u>	Dr. David Y. Lee	Fulmer 104A	335-9773	email: d.y.lee@wsu.edu
	Office Hours: by appointment			
	Prof. K W Hipps	Fulmer 116B	335-3033	email: hipps@wsu.edu
	Prof. James Brozik	Fulmer 123	335-3746	email: brozik@wsu.edu

Prerequisites

1. College level Physical Chemistry

Course Objectives, Learning Goals, and Expected Outcomes:

To become familiar with and able to apply concepts in surface science and kinetics.

Section 1: Surface structures and thermodynamics (Dr. D. Y. Lee)

Required textbook: Introduction to surface chemistry and catalysis, 2nd edition, by Samorjai and Li
(Ch. 1, 2 & 3)

Supplementary textbook: (1) Any Physical Chemistry textbook (e.g. McQuarrie and Simon Ch.31)
(2) Foundations of Materials Science and Engineering, by Simth and Hashemi
(Ch. 3)

Evaluation: one take-home problem set in the end of section, worth 33.3% of the course.

Topics:

1. Introduction to surfaces
 - Surface concentration: clusters and small particles
 - Thin films
 - Clean surfaces
2. Crystal and surface structures
 - Symmetry and unit cells
 - Vectors and Miller indices
 - Cubic, BCC, FCC, HCP and Diamond cubic structures
 - Surface structure notations + superlattices
 - Reconstruction; steps and kinks
 - Adsorption
3. Thermodynamics of surfaces
 - Definition of surface thermodynamic functions
 - Surface energy and heat capacity
 - Heats of adsorption and adsorption isotherms

Section 2: Kinetic processes at surfaces (Professor K W Hipps)

Required textbook: Introduction to surface chemistry and catalysis, 2nd edition, by Samorjai and Li

Supplementary textbook: (1) Any Physical Chemistry textbook (e.g. McQuarrie and Simon Ch.31)
(2) to be announced

Evaluation: Two or three take-home problem sets worth 33.3% of the course.

Topics:

4. Introduction to surfaces adsorption and desorption
5. Kinetic vs thermodynamic process at surfaces
6. Self-assembly and thin film growth

Section 3: Stochastic Chemical Kinetics (Professor J. A. Brozik)

Required textbook: None

Supplementary textbook: (1) Stochastic Processes in Physics and Chemistry by Van Kampen (Ch. 4-7)
(2) to be announced

Evaluation: Two or three take-home problem sets worth 33.3% of the course.

Topics:

1. Stochastic Processes
2. Markov Processes
3. The Master Equation
4. Fluctuation – Dissipation
5. Chemical Reactions

Academic Integrity:

Academic integrity is the cornerstone of higher education. As such, all members of the university community share responsibility for maintaining and promoting the principles of integrity in all activities, including academic integrity and honest scholarship. Academic integrity will be strongly enforced in this course. Students who violate WSU's Academic Integrity Policy (identified in Washington Administrative Code (WAC) 504-26-010(3) and -404 will receive a score of zero for that assignment or exam for the first instance. A second incident of cheating will result in an F for the course, without the option to withdraw from the course pending an appeal. All violations of the WSU Academic Integrity Policy will be reported to the Office of Student Conduct.

Cheating includes, but is not limited to, plagiarism and unauthorized collaboration as defined in the Standards of Conduct for Student: Washington Administrative Code (WAC) 504-26-010(3), found here:

<http://app.leg.wa.gov/WAC/default.aspx?cite=504-26-010>. If you have any questions about what is and is not allowed in this course, ask the course instructors before proceeding.

- Cheating or plagiarism in any form will not be tolerated.
- Cheating includes, but is not limited to: copying work **OR** allowing your work to be copied; use of unauthorized material at exams, any communication between students during an exam, and actively looking at another student's paper during an exam.
- Submission of identical data by two or more students who are not assigned to be laboratory partners will be considered cheating. Appropriate penalties will be applied to all parties.
- Students repeating the course must rework and rewrite all assignments. Plagiarism includes resubmitting previously graded homework or lab reports from a previous semester, even if they were your own work.
- Plagiarism also includes using laboratory data from another person or a previous semester.
- Use of any electronic device other than an approved calculator during an examination is cheating.

WSU Reasonable Accommodation Statement

"Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center [Pullman] or Disability Services at [name of campus] address on your campus] to schedule an appointment with an Access Advisor. All accommodations **MUST** be approved through the Access Center or Disability Services. For more information contact a Disability Specialist on your home campus."

Pullman or WSU Online: 509-335-3417, Washington Building 217; <http://accesscenter.wsu.edu>, Access.Center@wsu.edu

Final Grade: The grade will be determined by averaging grades given by each instructor:

Homework (25%):

Homework will tend to test problem solving ability. I will hand grade two or three of the assigned problems and your grade will be based on those problems. Not because they are the most important, but because I don't have time to hand grade all the problems you need to do to learn the material.

Homework is VERY important. Ideally you would do each problem until you can do them all with the book closed.

Class Participation (5%)

At the start of most classes, students will be selected to demonstrate and discuss the solution of a problem. Scores will be awarded based on your contributions to this effort.

Exam 1, 2, and 3 (70%)

All exams have equal value One of the three exams will be takehome. Please do not become complacent that you can find solutions to the questions without actually having to learn the material. Takehome exams tend

to be longer and more difficult than in class exams. Thermodynamics is a subject that must be digested slowly. Please try to keep up and work at a constant rate. Last minute studying for a thermodynamics exam is usually a recipe for poor performance. All exams are cumulative.