

## ECH 6727 - Interfacial Phenomena II: Spring 2009

Class Schedule; Wednesday 7<sup>th</sup> and 8<sup>th</sup> period

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Pre-recorded lectures will be available on line at the class website:

<http://perc.ufl.edu/courses/intephen2/default.asp>

At the website you will find also:

- Class Notes
- Homework assignments and their solution
- Quizzes and their solution
- Other supporting material (interesting papers, articles, and supplementary lecture material)

Since there is no textbook available to cover the whole course material the students are advised to frequently review the lectures.

For any time conflicts, inability to attend an exam or any other class related problems please contact Dr. Pyrgiotakis.

### Suggested Reference Books:

- 1) "Surfactants and Interfacial Phenomena, 2nd Edition," Milton J. Rosen, John Wiley & Sons; ISBN: 0471836516
- 2) "Physical Chemistry of Surfaces, 6th Edition," Arthur W. Adamson, Alice Gast (Contributor), John Wiley & Sons; ISBN: 0471148733
- 3) "Foundations of Colloid Science, 2nd Edition," Robert J. Hunter, Oxford University Press; ISBN: 0 19 850502 7
- 4) "Intermolecular & Surface Forces, 2nd Edition," Jacob Israelachvili, Academic Press; ISBN: 0-12-3751810

**Class lectures and notes would be posted on the course website.**

### Grading ECH 6727:

- The average of two Quizzes (20%)
- Homework assignments (15%)
- Final quiz (30%)
- Paint lab (35%)

**Important:** The syllabus for the quizzes is cumulative. Questions for the surprise and final quiz can include material from both mid semester and final team presentations respectively.

## SYLLABUS FOR INTERFACIAL PHENOMENA II (SPRING 2009)

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WEEK	MATERIAL
<b>Week 1</b>	<u>Solid Surfaces and Interfaces</u>
	a) Introduction b) Surface free energy c) Work of cohesion and adhesion d) Solid surfaces - Characteristics of solid surfaces - Solid surface free energy vs surface tension
<b>Weeks 2-5</b>	<u>Surface Forces</u>
	a) Attractive forces - van der Waals forces - Microscopic approach - Lifshitz theory - Derjaguin Approximation b) Electrostatic forces and the electrical double layer - Charge Development at Solid Interfaces - Electrical Double Layers - Electrokinetic Phenomena - Electrostatic Forces c) Hydrophobic attraction d) Measurement of surface forces - Surface force apparatus - Atomic force microscope - TIRM/Evanescence Wave Scattering Methods
<b>Weeks 6-9</b>	<u>Adsorption at the solid-liquid interface</u>
	a) Adsorption equations and models b) Surfactant adsorption - Surface activity and surfactant structures - Effect of surface chemistry - Role of surfactant structure - Change in interface properties - Structure at interface c) Polymers at interfaces - Adsorption and confirmation - Steric/Electro-steric repulsion - Depletion attraction - Polymer functionality and selective adsorption
<b>Weeks 10-14</b>	<u>Applications of interfacial phenomena</u>
	a) CMP (Chemical Mechanical Polishing) Slurries: - Colloidal Stability - Fundamentals - Coagulation/stability ratio b) Drug Delivery and Controlled Release of Actives: - Drug delivery systems

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- Factors affecting drug uptake and release
  - Charge and hydrophobicity considerations
  - Consequences
  - c) Cohesive powder flow (including drug particles)
    - Adhesion, Cohesion (interparticle forces)
    - Models of adhesion
    - Capillary adhesion
    - Application: Powder flow, coatings
  - d) Mineral Flotation
    - Solid-solid separations
    - Flotation
    - Flocculation/selective flocculation
  - e) Wetting and spreading
    - Contact angle
    - Thermodynamics of wetting
    - Effect of surfactants
    - Application: Drying of thin films
  - f) Friction, lubrication, and wear
    - Dependence of friction on nature of surface
    - Mechanisms of lubrication
    - Application: CMP
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**Academic Honesty Guidelines:** All students are required to abide by the Academic Honesty Guidelines which have been accepted by the University. The academic community of students and faculty at the University of Florida strives to develop, sustain and protect an environment of honesty, trust and respect. Students are expected to pursue knowledge with integrity. Exhibiting honesty in academic pursuits and reporting violations of the Academic Honesty Guidelines will encourage others to act with integrity. Violations of the Academic Honesty Guidelines shall result in judicial action and a student being subject to the sanctions in paragraph XIV of the Student Conduct Code. The conduct set forth hereinafter constitutes a violation of the Academic Honesty Guidelines (University of Florida Rule 6C1-4.017).

### **THE HONOR CODE**

We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."