10.420/10.520 Molecular Aspects of Chemical Engineering

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Office Hours: Immediately after class. Appointments made via email.

Text: None, but numerous topical handouts from the recent literature and other materials including:


Grading:

5% Problem Sets
30% Quiz 1 (October 25)
30% Quiz 2 (November 24)
35% Course Paper (Assignment made mid-term; paper is due on December 8)
### Course Calendar for 10.420/10.520

#### SEPTEMBER
- **8** | Course Introduction, Perspective on Intermolecular Interactions and Relevance to Application
- **10** | Molecular Interactions: Influence on Macroscopic Properties
- **13** | Review of Chemical Structures and Trends
- **15** | Polar and VanderWaals Interactions
- **17** | Dielectric Constants – Origin and Importance
- **20** | Solvation, Solvent Design, Solute Partitioning
- **22** |
- **24** | Chelation and Co-solvents
- **27** | Solvation of Large Molecules - Polymer Solubility
- **29** | Block Copolymers- Ordered Nanophases

#### OCTOBER
- **1** | Introduction to Solid State and Intermolecular Interactions
- **4** | Molecular Crystals
- **6** | Hydrogen Bonding in the Solid State
- **8** | Molecular Recognition and Self Assembly
- **11** | **STUDENT HOLIDAY –COLUMBUS DAY**
- **13** | Liquid Crystalline Systems - Thermotropic
- **15** | Liquid Crystalline Systems – Lyotropic and Bio Examples
- **18** | Micellar Systems
- **20** | Micellar Systems
- **22** | Micellar Systems / Applications
- **25** | QUIZ 1
- **27** | Introduction to Liquid/Solid Interactions
- **29** | Wetting

#### NOVEMBER
- **1** | Wetting
- **3** | Fundamentals of Adhesion
- **5** | Adhesion (special guest – Christine Ortiz)
- **8** |
- **10** | Molecular Adsorption
- **12** | Friction
- **15** | Polymer Adsorption/Adhesion to Surfaces
- **17** | Polymer Surface Modification/Surface Engineering
- **19** | Organic Monolayers (SAMs)
- **22** | Organic Monolayers
- **24** | Quiz 2
- **26** | **THANKSGIVING HOLIDAY**
- **29** | Bio applications of organic monolayers/bioadhesion

#### DECEMBER
- **1** | Other applications of surface modification
- **3** | Project Presentations
- **6** | Project Presentations
- **8** | Project Presentations