

## Chemistry 860: Chemistry and Physics of Amorphous Materials

Spring 2014 Syllabus

2 credits (MWF at 12:05 pm, 8335 Chemistry)

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Office hours: M 2:25 pm and by appointment

Course description: Glasses and other amorphous materials play an important role in current technologies (engineering plastics, optical fibers, organic light emitting diodes) and are being developed for use in emerging technologies (organic photovoltaics). This course will explore fundamental aspects of glass properties and glass formation. Molecular and polymeric organic glasses will be emphasized but connections will be drawn with computer simulations and a wider range of materials. *This course is offered for 2 credits only.*

Prerequisites: Graduate student status and undergraduate physical chemistry, or permission of instructor. I will assume some familiarity with thermodynamics and statistical mechanics.

Expectations for students: The course will involve reading and discussion of many research articles, review articles, and book chapters. There will be no textbook. I expect to spend less than 50% of our meeting time “lecturing”. Material presented in lecture will be partly targeted at the discussion of the previous period. For the class discussion to be effective, everyone needs to come to class having read and thought about the materials for that day. I will devise some systems to encourage this – perhaps calling on individual students to summarize the important points of the paper at the start of the discussion.

Course content: I will ask each student to write a paragraph on why they are taking this course. This input will modify to some extent the material covered in the class. Below is an outline that represents my current thoughts about course content. There is room to add material to this outline.

Course outline (numbers indicate estimated number of class meetings):

1. General introduction to supercooled liquids and glass formation (4)
  - The potential energy landscape
2. Molecular motion in supercooled liquids (4)
  - Diffusion
  - Structural relaxation
  - Theories
3. Crystallization from supercooled liquids and glasses (4)
  - Crystal growth rates
  - Nucleation
4. Mobility in glasses (7)
  - Molecular and ionic mobility
  - Mechanical properties
  - Surface mobility
5. Methods of glass formation/determination of glass structure (3)

Reading assignments: On Learn@UW, you will find pdf files of the reading assignments and a pdf file to summarize the assignments for each day of the class.

Exams: I expect to have about three exams during the semester. They might work as follows: On Monday, I would announce that the exam will be based upon a particular paper. On Wednesday, I would provide some questions for you to answer about that paper. The exam might occur in class on Wednesday or might be “take home”.

Course grading: Course grades will depend primarily upon participation in classroom discussion and also upon performance on the exams.

Class meeting time: This class will meet MWF at 12:05 pm. We will not meet every MWF. The schedule below tells you when we meet; some changes to the schedule may be announced later. A total of ~30 class meetings will occur.

Class Schedule:

<b>Week</b>	<b>Monday</b>	<b>Wednesday</b>	<b>Friday</b>
Jan 20,22,24	No meeting		
Jan 27,29,31			
Feb 3,5,7			
Feb 10,12,14			No meeting
Feb 17,19,21	No meeting	No meeting	No meeting
Feb 24,26,28			
Mar 3,5,7	No meeting	No meeting	No meeting
Mar 10,12,14			
Mar 17,19,21	Spring Break	Spring Break	Spring Break
Mar 24,26,28		?	
Mar 31;Apr 2,4			No meeting
Apr 7,9,11			No meeting
Apr 14,16,18			
Apr 21,23,25			
Apr 28,30;May 2			No meeting
May 5,7,9			