

## CHM 6580 – Polymer Rheology and Viscoelasticity (S18)

**Instructor:** Daniel Savin, 318 Leigh Hall (LEI), [savin@chem.ufl.edu](mailto:savin@chem.ufl.edu), 352-392-9150

**Office Hours:** M W 10:35 – 11:35 or by appointment  
I am generally available for questions via email or stopping by my office.

**Lecture:** M W F Period 3 (9:35 – 10:25), FLI 109

**Course Website:** This course has a Canvas page for notes, answer keys and announcements

**Textbook:** Rheology for Chemists, an Introduction (2<sup>nd</sup> Ed.), by Goodwin and Hughes

**Supporting Textbooks:** Polymer Chemistry (2<sup>nd</sup> Ed.), by Hiemenz and Lodge  
Introduction to Polymers (3<sup>rd</sup> Ed.), by Young and Lovell  
The Structure and Rheology of Complex Fluids, by Larson

**Course Description:** CHM 6580 is a course that provides an opportunity for participants to develop skills, strategies, and methods necessary to understand the basic principles of rheological and viscoelastic properties of polymers from a chemist's standpoint. This course is targeted to graduate students and senior undergraduates.

Topics:

1. Linear Elastic Solids
  - Basic forces: expansion/contraction, extension and shear
  - Stress tensors and deformations
  - Interrelationships between elastic moduli, Poisson's ratio
  - Thermodynamics of elasticity
2. Linear Viscous Fluids
  - Newtonian flow and simple shear
  - Measurement of viscosity: Capillary, Couette, cone/plate flow
  - Viscosity of suspensions and dilute polymer solutions
  - Viscosity of concentrated and undiluted polymers
3. Linear Viscoelasticity
  - Nature of the viscoelastic response
  - Creep, creep/recovery, and stress relaxation
  - Sinusoidal deformations and isochronal experiments
  - $T_g$  and time-temperature superposition
4. Non-linear Effects

**Grading:** Your final grade will be determined from the following:

Homework = 40%  
Midterm Exam = 20%  
Final Exam = 30%  
Term paper = 10%

Approximate Grade Ranges:			
> 90	A	69 - 72.99	C+
86 - 89.9	A-	64 - 68.9	C
82 - 85.9	B+	60 - 63.9	C-
77 - 81.9	B	56 - 59.9	D+
73 - 76.9	B-	50 - 55.9	D
		< 50	E

**Homework:** There will be ~ 4-5 homework assignments throughout the semester. Homework assignments will be worth 20 points each. The assignments should be presented in a **professional** manner, with the work, any assumptions and explanations presented **clearly**. When preparing graphs, you **must** use Excel or a comparable program. If you are doing a curve-fit, you must justify the choice of fitting function. While you are strongly advised to work in groups, **you must turn in your own work to receive any credit!** You must also reference the other members of your study group. Failure to adhere to these requirements will result in zero credit for the assignment.

**Makeups:** Homework assignments that are turned in late will not be accepted unless prior arrangements have been made.

**Midterm Exams:** There will be one midterm exam in the course. Tentatively scheduled for March 2<sup>nd</sup>, 2018.

**Term Paper:** There will be a ~10-page (TNR, 12pt. double spaced) term paper due on a topic related to polymer rheology or viscoelasticity. This paper can discuss the properties for a class of polymers, or it can be a literature review of some interesting polymer properties.

**Final Exam:** There will be a cumulative final exam for this course. It is currently scheduled for Thursday May 3<sup>rd</sup>, from 12:30 – 2:30 PM.

**Attendance:** Lecture attendance is essential for your success in this class. **More than three (3) absences for any reason is considered to be excessive.** If circumstances place the student in a situation that involves excessive absenteeism, the student should plan on dropping the class before the drop date or ask for a withdrawal from the class after the drop date. Unless special circumstances are involved, no work, including exams, can be made up if more than three absences are on record. Communication and the timing of the communication are keys to acceptable outcomes. Poor timing or no communication will result in an unacceptable outcome.

- Class Participation:** Students are expected to be prepared for class and to respond to questions from the instructor. Reading the material in the text, working problems, listening in class, and studying notes should prepare the student for answering the questions.
- Disabilities:** Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)) by providing appropriate documentation. Once registered, students will receive an accommodation letter, which must be presented to the instructor when requesting accommodations. Students with disabilities should follow this procedure as early as possible in the semester.
- Counseling:** The University of Florida provides counseling services for students, staff, and faculty. See <http://www.counsel.ufl.edu/> or call (352) 392-1575 during regular service hours (8am – 5pm). For other hours or on weekends call the Alachua County Crisis Center (264-6789). Students may also call the clinician on-call at Student Mental Health for phone callback and consultation at (352) 392-1171.
- Cell Phones:** Please put all cell phones and other digital devices on “silent mode” during all class periods. Thank you.
- Honor Code:** This class will operate under the policies of the student honor code, which can be found at: <http://www.registrar.ufl.edu/catalog/policies/students.html>. The students, instructor, and TAs are honor-bound to comply with the Honors Pledge: **We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.**