

CHEG 5367  
Polymer Rheology

**OUTLINE, Spring 2012**

Textbook: *Shaw*, **Introduction to Polymer Rheology**, Wiley, New York 2011

*Supplemental material will be e-mailed or posted.*

1. Introduction: How rheology is useful to polymer scientists (Chapter 1), and review of linear viscoelasticity.
2. The mechanics of Rheology: Stress (Chapter 2)
3. Rate of deformation (Chapter 3) Symmetric part, anti-symmetric part of the velocity gradient tensors?
4. Newtonian continuum mechanics, equations of change. (Chapter 4)
5. Non-Newtonian behavior—shear thinning (Chapter 5)
6. Non-Newtonian behavior—normal stresses (Chapter 6)
7. Effect of concentration and temperature (in Chapter 6)
8. Rheological methods for characterizing polymers (Chapter 7 and Chapter 12). Demo of a rheometer
9. Finite strain (Chapter 8)
10. Classes of constitutive equations, and how to use them
11. Molecular theory (solutions, melts and crosslinked materials) (Chapter 9)
12. Rheology of complex polymeric fluids (Chapter 12), especially nano-particle suspensions
13. Applications to polymer processing (Chapter 10)

Class operation: We will have homework, one “Midterm” exam, a Final exam and possibly (if time allows) a group project/oral report. Reading, discussing and doing the homework are the foundation of learning, and students are encouraged to be diligent about these activities. Please hand in individual answers to the homework; it will be graded and discussed. Grading will be approximately homework (20%), exams (60%) and report (if applicable) (20%).

We plan to invite rheology-oriented seminar speakers and perhaps some industrial rheologists to “greet and meet” the class, saying a few words about the types of rheology they do. Please be diligent about attending these sessions.