



CHE 694 Rheology

MW 6:00 – 7:15pm, FH314

Fall
2017

Course Description:

CHE 694 is the study of complex fluids along with methods of measuring their rheological and other properties, basic forces that produce diverse structures of complex fluids, theories and simulation techniques. Complex fluids defy the classical definitions of solids and liquids. This course will focus on common and not-so-common complex fluids including polymeric liquids and melts, suspensions of colloidal particles, micellar solutions, and liquid foams.

Instructor: Dr. Geyou Ao, Assistant Professor, Chemical and Biomedical Engineering
Fenn Hall 461, (P) 216-687-3522, g.ao@csuohio.edu

Office hours: Monday, Wednesday 1:30 pm - 2:30 pm, or by appointment

Prerequisites: Graduate standing in a physical science or engineering major or permission of instructor

Textbook: The Structure and Rheology of Complex Fluids
Ronald G. Larson, Oxford University Press, New York, 1999.

Recommended references: Rheology: Principles, Measurements, and Applications
Christopher W. Macosko, Wiley-VCH, Inc., New York, 1994

Tentative Course Outline:

- Introduction to complex fluids (Ch. 1) – 1 week
- Basic forces (Ch. 2) – 2 weeks
- Polymers (Ch. 3) – 2 weeks
- Particulate suspensions (Ch. 6) – 2 weeks
- Foams, emulsions, and blends (Ch. 9) – 1 week
- Liquid crystals (Ch. 10) – 2 weeks
- Liquid-crystalline polymers (Ch. 11) – 2 weeks
- Surfactant solutions (Ch. 12) – 2 weeks

Grading and Evaluation Procedures:

Grading:	10% Class participation (discussion of reading assignments, general participation in class, short quizzes)	A : 91-100%
	12% Written critical reviews of assigned papers	A-: 88-90%
	12% Other homework	B+: 84-87%
	20% Exams (2)	B : 80-83%
	30% Project (20% review paper, 10% presentation)	B-: 75-79%
	16% Final	C : 60-74%
		F : <60%

Project: Each student will select a topic for project report and presentation. The topic must be approved by Dr. Ao before mid-term. Students will write a

comprehensive literature review on the approved subject and give a presentation on the topic. Grading will be based on breadth, depth, integration of the literature, formatting and clarity. These include ability to synthesize information from a variety of sources and highlighting discrepancies in the literature. The contents of the presentations will be included in the final exam. The presentation format will be decided during the semester. Students are encouraged to choose topics related to their research or general interests. However, students are not allowed to submit documents previously written for another purpose. Additional guidelines on the project will be provided during the first few weeks of class. Presentations will be evaluated by both students and the instructor.

- Class participation:** Reading assignments will be made every week, and the research/application discussed in class. Active participation in these discussions is a key part of class performance. Announced and/or unannounced quizzes will be given periodically to assess progress and ensure that students are understanding the lectures and reading material.
- Written critical reviews:** The ability to assimilate and interpret data are key requirements for a professional career. The ability to clearly and concisely communicate in writing is also a prerequisite for career success. Therefore, student will have to write critical reviews of selected publications prior to the class discussion. Students are expected to be able to describe the main points, strengths and weaknesses of an assigned reading. Students should demonstrate in depth understanding as well as the larger implications of the work. Reviews should be 2-3 pages, double spaced, using 10-12 point font, with 1 inch margins and include citations.
- Homework:** Homework will be assigned periodically throughout the semester. Problems may be either conceptual or quantitative.
- Exams:** Two midterm exams will be given. Problems may be mathematical or conceptual.
- Final:** A comprehensive final will include general information from student presentations.
- Course policy statements:** Students are expected to attend all their scheduled classes. College work requires regular class attendance as well as careful preparation. Specific policies regarding class attendance are the prerogative of individual faculty members. Participation is a significant part of the grade. If you must miss a class then an email must be sent to the instructor 24 hours before class time. Graded in-class assignments can be made-up only for university excused absences and only for absences proceeded by an email to the instructor.
- Re-grade policy:** A typed explanation for why a re-grade is warranted needs to be submitted to Dr. Ao within three days of receiving the graded assignment.

Accommodations for Students with Disabilities:

Educational access is the provision of classroom accommodations, auxiliary aids and services to ensure

equal educational opportunities for all students regardless of their disability. Any student who feels he or she may need an accommodation based on the impact of a disability should contact the Office of Disability Services at (216) 687-2015. The Office is located in MC 147. Accommodations need to be requested in advance and will not be granted retroactively.

Notable Dates

Labor Day (September 4, 2017)

Columbus Day (October 10, 2017)

Last Day to Withdraw (November 3, 2017)

Veterans Day (November 10, 2017)

Thanksgiving Recess (November 23-26, 2017)

Final Exam (December 13, 2017; time: 6:00 – 8:00PM)

Tentative Course Schedule

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Aug 28	Intro to Rheology
Aug 30 – Sep 6	Chapter 1. Intro to Complex Fluids
Sep 6 – 20	Chapter 2. Basic Forces
Sep 25 – Oct 2	Chapter 3. Polymers
Oct 4	Exam 1
Oct 9 – 23	Chapter 6. Particulate Suspensions
Oct 23 – Nov 8	Chapter 10. Liquid Crystals
Nov 1	Exam 2
Nov 13 – Nov 22	Chapter 11. Liquid Crystalline Polymers
Nov 22 – Nov 29	Chapter 12. Surfactant Solutions
Dec 4 – Dec 11	Student Presentations
Dec 13	Final Exam