

SEMESTER SYLLABUS (September 6th, 2016)
CHE 594: Colloidal and Interfacial Phenomena (3 credits)
Fall Semester 2016

Semester Session: Fall

Instructor: Christopher Wirth

Lecture Date & Time: MW, 4:30PM – 5:45PM

Room: FH202

Email: c.wirth@csuohio.edu (FH 438)

Office Hours Date & Time: **Tuesdays, 4:00 PM – 5:00PM & Wednesdays, 3:30PM – 4:30PM**

Catalog Description: **Colloidal and Interfacial Phenomena**

Prerequisite: Graduate standing in Chemical or Biomedical Engineering or Permission of instructor.

Description: Fundamental aspects of colloidal suspensions, surface tension, wetting, surfactant adsorption, self-assembly, and interparticle interactions, as well as the importance of these phenomena to consumer, industrial, and biomedical applications.

Course Description: Students will develop a knowledge base that can be applied to his/her own research at CSU or in an engineering position outside of CSU. Lectures will be supplemented with in-class and take home problem sets. The course will culminate in a final project that will require students to conduct targeted reading and analysis of the current literature in colloids and interface science and to demonstrate a new insight or idea.

Textbook:

↪ Berg, J.C. “An Introduction to Interfaces and Colloids: The Bridge to Nanoscience”, World Scientific (2010)

Reference Material:

↪ Prieve, D.C. “Physical Chemistry of Colloids and Surfaces” © DC Prieve, 2014

↪ Hiemenz, P.C. “Principles of Colloid and Surface Chemistry”, 3rd Ed., Marcel Dekker (1997)

↪ Evans, D.F., Wennerstrom, H. “The Colloidal Domain: Where Physics, Chemistry, Biology, and Technology Meet”, 2nd Ed., Wiley (1999)

↪ Israelachvili, J. “Intermolecular and Surface Forces”, 3rd Ed., Elsevier (2010)

↪ Selected readings provided by instructor.

↪ Journal articles associated with final project.

Coordinator: Christopher L. Wirth, Assistant Professor, Department of Chemical and Biomedical Engineering

Goals: The objective of this course is to introduce students to the fundamentals of colloidal and interfacial phenomena. Students will be exposed to a broad selection of topics, including colloidal suspensions, surface tension, wetting, surfactant adsorption, interparticle interactions, electrokinetics, and phenomena in biology. Foundational knowledge of these topics will be developed via in-class and take home problem sets. Students will gain familiarity with current literature via reading and analysis of journal articles targeted in a research area picked by the student; this exercise will culminate in a final project.

ABET Category Content: The course fulfills the following Chemical Engineering Program Outcomes:

[a] an ability to apply knowledge of mathematics, science, and engineering

[e] an ability to identify, formulate, and solve engineering problems

[g] an ability to communicate effectively

[i] a recognition of the need for, and an ability to engage in life-long learning

[j] a knowledge of contemporary issues

Prerequisites by Topic:

↪ Graduate standing in Chemical Engineering or Permission of instructor.

Topics and Tentative Outline

What is a colloid and how are they related to interfaces?	Week 1
Brownian motion	Week 2
Sedimentation	Week 3
Surface tension	Weeks 4 – 6
Exam 1	
Contact angle & wetting	Week 7
Adsorption from solution	Weeks 8 – 9
Micellization & self-assembly	Week 9
Intermolecular forces & introduction to the electric double layer	Weeks 10 – 12
Exam 2	
Introduction to light scattering	Week 13
Colloidal and interfacial phenomena in biology	Week 14
Written portion of project due & time allotted for project presentations	Week 15

Most of the course material, assignments, and outside office-hours consultation will be done via the Chemical Engineering Courses Web Site: <http://www.csuohio.edu/elearning/blackboard/index.htm>
Access to the Internet can be procured from College facilities, or via Internet Access sites.

Laboratory Projects: N/A

Prepared by: Christopher Wirth, Assistant Professor, Department of Chemical and Biomedical Engineering

Grading Policy: The final grade will be based on 5 problem sets (30%), two exams (40%), and a final individual project (30% = 20% written + 10% oral).

Project description:

- (1) Extensive written review and critical analysis of current literature in research area picked by student. Research area must be related to colloidal and interfacial phenomena and cleared by instructor (**Topic by September 30th, outline by October 15th, mature draft by November 15th**).
- (2) Student must identify a critical research question in the chosen area. In addition, the student must develop an idea that could potentially answer the research question. For example, a detailed description of an experiment and/or calculations will satisfy this requirement. **Written project should be 13 – 15 pages, double spaced, including all figures. References do not count toward this page total.**
- (3) Oral presentation to class that clearly describes specific research area and new insight (Week 15). **Oral presentations will be scheduled for no more than 12 minutes each.**

Grading Scale:

A	>93%
A(-)	88-93%
B(+)	83-88%
B	78-83%
B(-)	73-78%
C(+)	68-73%
C	60-68%
D	50-60%
F	<50%

Important Dates:

September 5 th	NO LECTURE
October 10 th (Tentative)	EXAM 1
November 14 th (Tentative)	EXAM 2