

Interfacial Phenomena: Wetting and Capillarity

EML6934 Section YS25

Class Periods: M, W, F Period 2 (8:30 AM – 9:20 AM)

Location: FLG 0275

Academic Term: Fall 2025

Instructor:

Youngsup Song

song@mae.ufl.edu

352-392-0831

Office Hours: M, W 10 – 11 AM at NEB 227

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

- N/A

Course Description

Introduction to the fundamentals of surface and interfacial tension, emphasizing thermodynamics, wettability, and interfacial phenomena. Students will learn to analyze and design systems involving textured surfaces, surfactants, and fluid interfaces. Credits: 3

Course Pre-Requisites / Co-Requisites

EAS4101 or EGN3353C, EML3100 or equivalent

Course Objectives

This course explores the fundamental and applied aspects of interfacial systems, focusing on surface and interfacial tension. Topics include the thermodynamics of interfaces, the Gibbs adsorption equation, surfactants, curvature effects on fluid equilibrium, adhesion, cohesion, and wettability with particular emphasis on textured surfaces. Through theory and experimental examples, students will develop the skills to analyze and design systems governed by interfacial phenomena.

Relation to Program Outcomes (ABET):

The table below is an example. Please consult with your department's ABET coordinator when filling this out.

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Medium
3. An ability to communicate effectively with a range of audiences	Low
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Medium
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Not Covered

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Not Covered
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbook

- None

Recommended Materials

- Capillarity and Wetting Phenomena by Pierre-Gilles Gennes, Françoise Brochard-Wyart, and David Quéré

Course Schedule

- Lecture & assignment schedule is available on the last page.

Important Dates

- 09/24/2025: Homework 01 Due
- 10/15/2025: Homework 02 Due
- 11/05/2025: Homework 03 Due
- 11/19/2025: Homework 04 Due
- 12/03/2025: Homework 05 and Final Project Report Due

Attendance Policy, Class Expectations, and Make-Up Policy

Students are responsible for participating, staying up-to-date on all announcements, in-class lectures, posted video lectures, reading assignments and homework. Even though class attendance will not be used for assigning grades, it is critical that students attend the class regularly for the successful completion of this course. Requirements for class attendance, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

Homework

Homework assignments will be posted online and are due two weeks after posting by 11:59 pm (see the final three pages for the detailed schedule). A total of five problem sets will be assigned. The first assignment (HW00) is optional and will count for bonus credit. All submission must be made through Canvas only. Group discussions are encouraged, but each student must submit their own individual work. Solutions and grades will also be posted on Canvas. Show all your work, clearly mark final answers, and ensure submissions are neat and legible. Late submissions will not be accepted, except only in rare cases such as medical emergencies.

Exams

- No exams

Final Project: “Teach Your Professor and Peers”

The final project is designed to give you the opportunity to delve into a specific topic. Each student will select a topic for their project. A list of suggested topics will be provided, but you are also encouraged to propose your own, subject to approval by the instructor to ensure its relevance to the course. Projects can take one of the following forms: (1) A comprehensive literature review + your thoughts on a relevant and focused topic; (2) An experimental or computational study that is relevant (but feasible within the scope of the semester).

Deliverables include (1) A final report (a detailed report documenting your project) and (2) In-class presentation (a presentation summarizing your findings and teaching the core concepts to your classmates and the professor). Final presentations will be scheduled for the last three class sessions (subject to class enrollments). Specific dates will be assigned and may be adjusted based on the final class schedule.

Your final project grade will be based on both the written report and the presentation, with an emphasis on your ability to effectively communicate complex information. In particular, presentation grading will include: (1) expertise and comprehensiveness (you are expected to be an expert on your chosen topic); (2) clarity and rationale (the logical structure and clear delivery of your presentation); (3) peer evaluation (how well your classmates understand the topic after your presentation); (4) Q&A session (the quality and depth of your responses to questions from the audience).

Evaluation of Grades

Assignment	Percentage of Final Grade
Homework	40%
Final Report	30%
Final Presentation	30%
Total	100%

Grading Policy

Any re-grade requests must be submitted to Dr. Song within three days after the grade is returned. Active participants in class discussion may receive 1–3% bonus instructor credit.

Overall	Grade	Points
95 – 100	A	4.00
90 – 94.9	A-	3.67
85 – 89.9	B+	3.33
80 – 84.9	B	3.00
75 – 79.9	B-	2.67
65 – 74.9	C+	2.33
55 – 64.9	C	2.00
45 – 54.9	C-	1.67
30 – 44.9	D	1.00
0 – 29.9	E	0.00

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Notice of Copyright

Materials in this course – unless otherwise indicated – are protected by United States copyright law [Title 17, U.S. Code]. Materials are presented in an educational context for personal use and study and should not be shared, distributed or sold in print – or digitally – outside the course without permission.

Academic Policies & Resources

To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: <https://go.ufl.edu/syllabuspolicies>. Instructor-specific guidelines for courses must accommodate these policies.

Commitment to a Positive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Coordinator
- HWCoe Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu

EML6934 Interfacial Phenomena: Wetting and Capillarity – Fall 2025 Schedule

Week	Date	Scheduled Topic (provisional)	Assignments
1	8/22 Fri	L01 Course Logistics & Introduction	HW00 post (CV)
2	25 Mon	L02 Introduction & Basic Concepts	
	27 Wed	L03 Definition of Scaling and Surface Tension	HW00 due
	29 Fri	L04 Definition of Scaling and Surface Tension	
3	9/3 Wed	L05 Definition of Scaling and Surface Tension (Recording)	
	5 Fri	L06 Cohesion & Adhesion (Recording)	
4	8 Mon	L07 Cohesion & Adhesion (Recording)	
	10 Wed	L08 Wetting (Recording)	HW01 post
	12 Fri	L09 Theoretical Formalism – Fluid Mechanics	
5	15 Mon	L10 Theoretical Formalism – Fluid Mechanics	
	17 Wed	L11 Theoretical Formalism – Fluid Mechanics	
	19 Fri	L12 Theoretical Formalism – Fluid Mechanics	
6	22 Mon	L13 Capillary Rise	
	24 Wed	L14 Capillary Rise	HW01 due
	26 Fri	L15 Capillary Rise	
7	29 Mon	L16 Wetting on Textured Solids	
	10/1 Wed	L17 Wetting on Textured Solids	HW02 post
	3 Fri	L18 Wetting on Textured Solids	
8	6 Mon	L19 Wetting on Textured Solids	
	8 Wed	L20 Wetting on Textured Solids	
	10 Fri	L21 Wetting on Textured Solids	
9	13 Mon	L22 Wetting of Reentrant Structures (Recording or Zoom)	
	15 Wed	L23 Wetting of Reentrant Structures (Recording or Zoom)	HW02 due
10	20 Mon	L24 Spinning, Tumbling, and Rolling Drops	Project topic selection
	22 Wed	L25 Marangoni Flows	HW03 post
	24 Fri	L26 Marangoni Flows	
11	27 Mon	L27 Marangoni Flows	
	29 Wed	L28 Marangoni Flows	
	31 Fri	L29 Measurements of Surface/Interfacial Tensions of Fluids	
12	11/3 Mon	L30 Measurements of Surface/Interfacial Tensions of Fluids	
	5 Wed	L31 Spreading	HW 03 due, HW04 post
	7 Fri	L32 Thermodynamics of Interfaces	
13	10 Mon	L33 Thermodynamics of Interfaces	
	12 Wed	L34 Thermodynamics of Interfaces	HW05 post
	14 Fri	L35 Insoluble Monolayers	
14	17 Mon	L36 Fluid Instability	
	19 Wed	L37 Final presentation	HW04 due
	21 Fri	L38 Final presentation	
15	Thanksgiving week		
16	12/1 Mon	L39 Final presentation	
	3 Wed	L40 Final presentation	HW05 due Final report due