

Class Lectures:	T/R 12:30 – 1:50 PM (Warren Lecture Hall 2204) M 9:00-9:50 AM (PFBH Fung Auditorium)
Discussion Sections:	M 2-2:50 PM (PFBH 161; Alex) F 11-11:50 AM (CSB 004; Aileena)
Instructor:	Professor Adam J Engler (aengler@eng.ucsd.edu) Sanford Consortium Building 2005 / Jacobs 5408
Office Hours:	F 9-10 AM in PFBH 291
Teaching Assistants:	Aileena Nelson (acnelson@eng.ucsd.edu) Alexander Whitehead (alwhiteh@eng.ucsd.edu)
Recommended Text:	White, <i>Fluid Mechanics</i> (7 th Ed.), McGraw-Hill, 2010 Boal, <i>Mechanics of the Cell</i> (2 nd Ed.), Cambridge Univ. Press, 2012

Course Objectives

To learn in depth the application of mechanics over a variety of length scales, from mammalian blood vessels to the cells that make up these structures to the bio-viscoelastic, non-Newtonian fluids that flow through them. We will investigate the properties of cells and fluids, analyze the mechanical underpinnings of disease, and study the design of interventions and assist devices.

Homework

The homework assignments are a very important part of the course and consist of reviews, selected readings that supplement the class material, and problems for grading. Problems assigned for grading consist of two parts, analysis and design. Solution of the design problems is a basic requirement for passing the course. Solutions to the homework set will be presented in the exercise sessions *but will not be posted online*. The homework assignments are due on the *dates and times* indicated on each assignment. No late submissions can be accepted.

Acknowledgement

You are encouraged to discuss the homework problems with other students (not copy), the Teaching Assistants, and Dr. Engler. But you are expected to write down the solutions to the homework problems entirely by yourself. Therefore only *hand written* homework sets will be accepted (unless indicated). Any assistance you received for homework solution needs to be listed in the Acknowledgement at the end of each solution set. Failure to do so is considered plagiarism and no points will be awarded. Subsequent violations will be referred to the Dean.

Course Evaluation

Grading will consist of 1) approximately 6 homework sets counting for 20%, 2) three exams counting for 60% (20% each), and 3) a computational assignment counting for 20% of your grade (handed out in week 7). All exams are closed book with one 8.5" x 11" formula page that you make yourself. It must be *hand written* and turned in with your exam. Your lowest HW grade will be dropped if CAPE participation exceeds 75%.

Re-grading Policy

All regrade requests must be in writing, explaining the issue in grading, and must be turned in to Dr. Engler or the TAs within 1 week of the assignment's return to the class after grading. Aside from re-grades for clerical errors (i.e error in adding up total points), the entire exam or homework will be re-graded.

Date*	Topic	Book (Chpt)	Homework
4/1	No Class		
4/2	Intro / Solids vs. Fluids: Hydrostatics	White (2)	
4/4	Fluids: Pressure Distributions	White (2)	
4/8	Fluids: Control Volumes, Transport	White (2)	
4/9	Fluids: Conservation Laws: Mass	White (3)	HW 1 due
4/11	No Class		
4/15	Fluids: Conservation Laws: Momentum	White (3)	
4/16	Fluids: Bernoulli Eq'ns	White (4)	HW 2 due
4/18	Fluids: Navier-Stokes Equation & Assumptions	White (4)	
4/22	Fluids: N-S Examples	White (4)	
4/23	Fluids: N-S Examples	White (4)	HW 3 due
4/25	Exam 1: Fluids		
4/29	Fluids: Simplifications, Dimensionless Analysis	White (5)	
4/30	Fluids: Pipe Flow, Plug Flow, and Blood	White (6)	
5/2	Fluids: Boundary Layers	White (7)	
5/6	Fluids: Dimensionless Navier-Stokes	White (7)	
5/7	Fluids: Time-Dependent Navier-Stokes	White (7)	HW 4 due
5/9	Fluids: Stokes Flow	White (7)	
5/13	Fluids: Casson's and Starling's Equations	Fung (5)	
5/14	Cells: Cytoskeleton and its Organization	Boal (7-10)	HW 5 due
5/16	Exam 2: Fluids		
5/20	No Class		
5/21	No Class		
5/23	Cells: Polymers, Elasticity	Boal (2)	
5/27	No Class (Memorial Day)		
5/28	No Class		
5/30	Cells: Persistence Length	Boal (3)	
6/3	Cells: Protein Unfolding	Boal (3)	
6/4	Cells: Mechanotransduction	Boal (5)	HW 6 due
6/6	Cells: Law of LaPlace, Membrane Bending	Fung (4)	
6/10	Exam 3: Cells**, ***		

***Note that:**

Monday classes are 10:00-10:50am

Tuesday/Thursday classes are 12:30-1:50pm

****June 10, 11:30am-2:30pm, Location TBA**

*****Matlab assignment due**