

- Class Lectures:** TR 12:30 – 1:50 PM (Pepper Canyon Hall 121)  
W 1:00-1:50 PM (Pepper Canyon Hall 121)
- Discussion Sections:** M 1-1:50 PM (Center 218)  
F 11-11:50 AM (HSS 1315)
- Instructor:** Associate Professor Adam J Engler ([aengler@ucsd.edu](mailto:aengler@ucsd.edu))  
Sanford Consortium Building 2005 / PFBH 429
- Office Hours:** M 11:00AM-12:00 PM in PFBH 429
- Teaching Assistants:** Ajay Sapre ([asapre@ucsd.edu](mailto:asapre@ucsd.edu))  
Xin Fang ([xif033@ucsd.edu](mailto:xif033@ucsd.edu))
- Recommended Text:** White, *Fluid Mechanics* (7<sup>th</sup> Ed.), McGraw-Hill, 2010  
Boal, *Mechanics of the Cell* (2<sup>nd</sup> 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
3/29	Introduction Fluids: Pressure Distributions	White (2)	
3/30	Fluids: Control Volumes, Transport	White (2)	
3/31	Fluids: Conservation Laws: Mass	White (3)	
4/5	Fluids: Conservation Laws: Momentum	White (3)	HW 1 due
4/6	Fluids: Bernoulli Eq'ns	White (4)	
4/7	Fluids: Navier-Stokes Equation & Assumptions	White (4)	
4/12	Fluids: N-S Examples	White (4)	HW 2 due
4/13	<b>No Class</b>		
4/14	Fluids: N-S Examples		
4/19	<b>Exam 1: Fluids</b>		HW 3 due
4/20	Fluids: Simplifications	White (5)	
4/21	Fluids: Dimensionless Analysis	White (5)	
4/26	Fluids: Pipe Flow, Plug Flow, and Blood	White (6)	HW 4 due
4/27	Fluids: Boundary Layers	White (7)	
4/28	Fluids: Dimensionless Navier-Stokes	White (7)	
5/3	Fluids: Stokes Flow	White (7)	HW 5 due
5/4	Fluids: Vessels and Starling's Equation	Fung (5)	
5/5	Cells: Polymers, Elasticity	Boal (2)	
5/10	<b>Exam 2: Fluids</b>		
5/11	Cells: Persistence Length	Boal (2)	
5/12	Cells: Protein Unfolding	Boal (3)	
5/17	Cells: Cytoskeleton and its Organization	Boal (7-10)	
5/18	<b>No Class</b>		
5/19	<b>No Class</b>		
5/24	Cells: Cytoskeletal Mechanics	Boal (7-10)	HW 6 due
5/25	Cells: Mechanotransduction Models, Adhesion	Boal (7-10)	
5/26	Cells: Membranes	Boal (5)	
5/31	Cells: Law of LaPlace, Membrane Bending	Fung (4)	
6/1	Cells: Matlab Assignment Help		
6/2	<b>No Class: Matlab Due</b>		
6/6	<b>Exam 3: Cells**</b>		

**\*Note that:**

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

**Wednesday classes are 1:00-1:50pm**

**\*\*June 6, 11:30am-2:30pm, Location Warren Lecture Hall 2204**