

BE 437 NANOMETER SCALE
PROCESSES IN LIVING SYSTEMS (Spring 2018)

The world at the nanometer-scale is full of dynamic phenomena whose behavior can be described by a set of rules that are vastly different than those encountered at the macro scale. Biological processes that are of particular contemporary interest, such as cell differentiation, cell mechanical properties, and neuronal signaling, are stimulated by the activity and interaction of biomolecules at the nanoscale. Thus, an understanding of the physics and the tools that engineers have designed to study such systems is a vital component toward overcoming an immense array of challenging problems in the biological and medical sciences. This course will focus particularly on a conceptual and mechanistic understanding of technologies that permit the study of events at the nanometer scale.

Course information: The class meets from 8:00 to 9:45am Mondays and Wednesdays in CAS B20. Prerequisites for this class include probability (BE200 or equivalent), chemistry (CH101 or CH131), and physics (PY212).

Instructors: Prof. Michael Smith Joanna Chiu Jeffrey McMahan
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Office hrs: 11 to 1 Wednesdays

Textbooks: A variety of selected readings, in addition to the course notes, will be provided to the students using Blackboard.

Grading:	Homework	40%
	Quizzes	45%
	Presentation	10%
	Project	5%

22 Jan	Active Learning Demo / The Scallop Theorem
24 Jan	Diffusion
29 Jan	Diffusion 2
31 Jan	Tissue Mechanics
5 Feb	Cell Mechanics I
7 Feb	Cell Mechanics II
12 Feb	Intracellular Structures
14 Feb	Intracellular Structures (cont.)/ Extracellular Structures
20 Feb	Active Learning I
21 Feb	Active Learning I
26 Feb	Quiz 1
28 Feb	Mechanobiology
5 Mar	<i>No Class: Spring Break</i>
7 Mar	<i>No Class: Spring Break</i>
12 Mar	Day in the Life of a cell experimentalist
14 Mar	Insight: Microrheology I (Microscopes)
19 Mar	Insight: Microrheology II (Single particle tracking)
21 Mar	Insight: Microrheology III
26 Mar	Micro- and nano-machines I
28 Mar	Micro- and nano-machines II
2 Apr	Quiz 2
4 Apr	Receptor/Ligand interactions I
9 Apr	Receptor/Ligand interactions II
16 Apr	<i>No Class: Marathon Monday</i>
18 Apr	Fabrication and self assembly
23 Apr	Nano challenges and fears
25 Apr	Active Learning II
30 Apr	Active Learning II (Final Projects DUE)
2 May	<i>No Class (Get ready for Senior Design Project Conference Day)</i>
	Quiz 3 DUE on our assigned Final Exam Date (Covers all lectures)