BIM 262 Syllabus **UC Davis, Winter quarter**

CRN: _____, 4 units

"Cell and Molecular Biophysics for Bioengineers"

When? _____ (lectures)

Where? GBSF 2202

Who? Instructor: Volkmar Heinrich volkmar@gmail.com
530-754-6644
http://bme.ucdavis.edu/heinrichlab/

Teaching Assistant:

WEB → through "Canvas" or registrar

Texts No required text. Some reading material will be supplied along with lecture notes. I will point out useful references as we go along. Recommended illustrative reading includes parts of the following books:

J. HOWARD, *Mechanics of Motor Proteins and the Cytoskeleton*, Sinauer Associates Inc., 2001

J.N. ISRAELACHVILI, *Intermolecular and Surface Forces*, Academic Press, 1992

K.A. DILL and S. BROMBERG, *Molecular Driving Forces: Statistical Thermodynamics in Biology, Chemistry, Physics, and Nanoscience*, Garland Science, 2010

D. BOAL, *Mechanics of the Cell*, Cambridge University Press, 2002

D.A. MCQUARRIE and J.D. SIMON, *Physical Chemistry: A Molecular Approach*, University Science Books, 1997

Instructive WEB sites worth bookmarking are:

http://en.wikipedia.org/wiki/Main_Page (online encyclopedia, use with care)
http://scienceworld.wolfram.com/ (more rigorous set of online encyclopedias)
http://mathworld.wolfram.com/ (extensive math resource, part of the above)

Entry in Course Catalog

262. Cell and Molecular Biophysics for Bioengineers (4) Lecture—4 hours.

Prerequisite: course 284 or equivalent (may be taken in parallel); graduate standing; undergraduate students by consent of instructor.

Introduction to fundamental mechanisms governing the structure, function, and assembly of bio-macromolecules. Emphasis is on a quantitative understanding of the nano-to-microscale interactions between and within individual molecules, as well as of their assemblies, in particular membranes.

Approximate **Grading Scheme**

Homework & quizzes:	35%
Midterm exam:	25%
Final exam:	40%

Homework is due one week after assigned unless otherwise advised. In general, late submissions will receive no credit.

Objectives

This course aims to teach students how to think critically and quantitatively about the small bits of life and their mutual interactions. A basic intuition for the fundamental concepts that govern these interactions will provide the background needed, for example, for an informed bottom-up design of instruments or biomaterials. The emphasis in this course is on *understanding* biomolecular mechanisms from an *engineering* perspective, that is, in terms of physical laws and mathematical descriptions. In accord with the overall breadth of the field of BME, the course content is at the interface of biology, physics, and chemistry. It requires basic math skills in order to derive, understand, or apply simple models of the considered biomolecular processes. A rough outline of the course includes the following content: structure of biomolecules; physical properties of polymers; biomolecular interactions in water, role of thermal motion; basic solution thermodynamics; quantitative interpretation of molecular transitions, effect of force; molecular basis of cell adhesion; self-assembly and physical properties of biomembranes.

Schedule

Holidays:	TBA
Midterm exam:	TBA
Final exam:	TBA