Biomedical Engineering 418
Quantitative Cell Biology
Winter 2017

I. Logistics

Instructor: Kelly Arnold, Ph.D., Department of Biomedical Engineering
Email: kbarnold@umich.edu
Location and Time: 1017 DOW, Tues/Thurs 9:00-10:30 AM
Instructor Office Hours: Thursdays 1-3 pm (location TBD)

GSI: Katy Norman (kcnorman@umich.edu)
GSI Office Hours: Mondays (time and location TBD)
Class website: notes and papers posted to CANVAS website

Textbooks and Resources:

1) ***Physical Biology of the Cell*** **(PBoC)** (1st or 2nd edition), by Rob Philips, Jane Kondev, Julie Theriot, Hernan G. Garcia
2) ***Molecular Biology of the Cell*** (**MBoC**) (6th edition)
3) **Matlab** : Free download through UM (https://www.itcs.umich.edu/sw-info/math/MATLABStudents.html)

II. Course Description and Goals

This course introduces the fundamentals of cell structure and function from a quantitative or physical perspective. The goal is to provide an understanding of cell biology with a quantitative perspective that is of particular interest and importance to biomedical engineers. Specifically, this course is for biomedical engineers to learn the basic principles, approaches and applications of quantitative modeling to cell biology, and to master the basic skills of quantitative or semi-quantitative analysis applicable to a broad number of topics. Through discussion of a collection of important and relevant problems in cell biology, the course adopts a central notion best described by the authors in the preface of the textbook: “an appropriate application of a relatively small number of fundamental physical models can serve as the foundation of whole bodies of quantitative biological intuition, broadly useful across a wide range of biological problems.” Students will also gain practical experience applying quantitative approaches using Matlab software.

III. Instruction Format and Grading

A typical class will include both didactic lecture, question/answer periods, and practice examples in Matlab. Active participation is required, in the form of pre-lecture reading and asking/answering questions during class. Exceptional performance in these regards will be given extra credit (up to 2%) toward the final grade.

Homework assignments (25%) will be semi-regular, usually assigned every or every other Wednesday and due the following week. Late homework within one week after due date will be discounted 50%, but no late homework will be accepted for the assignments before exams because answer keys will be posted sooner for reviewing purposes.

There will be two exams— exam 1 (25%), exam 2 (25%), and a final project (25%).

Grading scale:
97-100% (A+); 93-96% (A); 90-92% (A-); 86-89% (B+); 83-85% (B); 80-82% (B-); 76-79% (C+); 73-75% (C); 70-72% (C-); 67-69% (D+); 63-66% (D); 60-62% (D-); 0-59% (F).

VI. Tentative Outline (course topics and schedule may change based on progress**)**

Date	**Topic**	**Reading**
01/5/17	Introduction and Mechanical and Chemical Equilibrium	PBOC: 9-20; 181-208 Download Matlab
01/10/17	Mechanical and Chemical Equilibrium / Introduction to Matlab	
01/12/17	Mechanical and Chemical Equilibrium / Introduction to Matlab	
01/17/17	Cytoskeleton	
01/19/17	Cytoskeleton	
01/24/17	Cytoskeleton	
01/26/17	Cytoskeleton	
01/31/17	Membranes	
02/02/17	Membranes	
02/07/17	Membranes	
02/09/17	Bioelectricity	
02/14/17	Bioelectricity	
02/16/17	Bioelectricity	
02/21/17	Review	
02/23/17	**Exam 1**	
02/28/17	**SPRING BREAK**	
03/02/17	**SPRING BREAK**	
03/07/17	Cell Junctions and ECM	
03/09/17	Cell junctions and ECM	
03/14/17	Cell junctions and ECM	
03/16/17	Cell signaling	
03/21/17	Cell signaling	
03/23/17	Cell signaling	
03/28/17	Cell signaling	
03/30/17	Cell signaling	
04/04/17	Cell signaling	
04/06/17	Cell signaling	
04/11/17	**Exam 2**	
04/13/17	Cell signaling	
04/18/17	**Final Project Due**	