BIMM 140 Syllabus Gürol Süel, Ph.D. gsuel@ucsd.edu

This syllabus is for the first half of BIMM140 (Section 1). Information on the second half of the course and on the discussion sessions can be found in a separate syllabus.

Overall questions that will be pursued in Section 1 of the course:

- Why is it important to understand that biology is based on random processes
- What is randomness in biology?
- How does randomness arise?
- How is randomness measured in biological systems?
- Does randomness have a purpose in biology?

Section 1: This section serves to introduce the concept of randomness (stochasticity) in biology, which is an advanced topic that is typically not covered sufficiently in standard biology textbooks. This section will also provide a conceptual framework for section 2 of the overall course.

Biology is based on random processes and the evidence is all around us. However, we often do not realize appreciate the importance of randomness for all living systems. In section 1, students will be introduced to the concept of randomness in biology and also how randomness can arise both in space and time. The overall goal is to provide a more realistic and deeper understanding of actual molecular and biological processes that take place within the cell. Specifically, we will start with randomness at the single molecule level and then expand all the way to the population level. We will refer to a few select research papers that represent landmark studies on this topic.

At the conclusion of this section, we will have discussed fundamental questions such as: What is randomness in biology? How does randomness arise in a biological system? How can we measure randomness as a function of time and space? What is the functional role of randomness in biology? And why it is absolutely necessary to be quantitative in order to understand biological processes that are based on randomness.

- September 23 Introduction to course and concept of stochasticity (a.k.a. noise/randomness)
- September 26 What is the source of randomness? Single molecule events enzymes
- September 28 Current topic: random mutations in RNA viruses
- September 30 What is the source of randomness? Single molecule events enzymes
- October 3 Randomness in the brain noisy ion channels
- October 5 Can gene expression be random? The "noisy" central dogma of biology
- October 7 Can gene expression be random? The "noisy" central dogma of biology
- October 10 Randomness in cellular differentiation bacteria
- October 12 Randomness in cellular differentiation bacteria and beyond
- October 14 Randomness in development The compound eye of fruit flies
- October 17 Can cells control/suppress noise organization and timing.
- October 19 How does the brain cope with noisy channels?
- October 21 How can multicellular development be accurate despite noise?
- October 24 Review for the midterm
- October 26 Midterm (in person)

<u>Canvas</u>

Information and quizzes for this section of the course will be presented on Canvas. Ensure you set up your notifications correctly. Students are responsible for any information sent out through Canvas announcements, regardless of their notification settings.

<u>Podcast</u>

Podcasts of the lectures (with slides) in Section 1 will be available in Canvas.

Office Hour

Prof. Süel's office hour is scheduled on Wednesdays from 4-4:30 p.m. via Zoom. You can access the Zoom link in the Canvas calendar. You must sign into the Zoom meeting using your UCSD account. Even if you are signed into Canvas with your UCSD credentials, you also must be signed into Zoom with your UCSD credentials. If you have trouble logging into the meeting, do the following: 1) Sign out of Zoom completely. 2) Navigate to ucsd.zoom.us. 3) Sign in using Single Sign On. 4) Then sign into Canvas, click on the calendar, and then enter the meeting via the link.

<u>Grades</u>

Each of the two sections of this course is worth 50 points for a total of 100 points. The points breakdown for Section 1 is as follows:

3 Quizzes: 3 x 8 points = 24 points 1 Midterm: 26 points

Required Survey

You must complete the required (ungraded) survey on Canvas by September 30.

<u>Quizzes</u>

There will be three quiz assignments for this section. These assignments are to be completed outside of lecture time. They will be available at noon on the following Fridays: September 30, October 7, and October 14. They each have to be completed by the following Monday at 10 a.m. Once you begin each assignment, you will have 45 minutes to finish it. Please contact me if you need a time accommodation.

The quizzes are to be completed independently. If it is determined that you cheated on the quiz or took it together with another student, you will get a zero on the quiz.

<u>Midterm</u>

The midterm will be held in-person during lecture time on Wednesday, October 26. You may not use notes on the midterm.

Statement of Academic Integrity

"Academic Integrity is expected of everyone at UC San Diego. This means that you must be honest, fair, responsible, respectful, and trustworthy in all of your actions. Lying, cheating or any other forms of dishonesty will not be tolerated because they undermine learning and the University's ability to certify students' knowledge and abilities. Thus, any attempt to get, or help another get, a grade by cheating, lying or dishonesty will be reported to the Academic Integrity Office and will result sanctions. Sanctions can include an F in this class and suspension or dismissal from the University. So, think carefully before you act by asking yourself: a) is what I'm about to do or submit for credit an honest, fair, respectful, responsible & trustworthy representation of my knowledge and abilities at this time and, b) would my instructor approve of my action? You are ultimately the only person responsible for your behavior. So, if you are unsure, don't

ask a friend—ask your instructor, instructional assistant, or the Academic Integrity Office. You can learn more about academic integrity at academicintegrity.ucsd.edu" (Source: Academic Integrity Office, 2018)