PHYS 3050
Introduction to Biophysics
Winter 2019

Instructor: Stefan Wallin, office C1061, phone 864-8880, email swallin@mun.ca
Class: Tuesday and Thursday 2:00-3:15pm in room C3067.
PR: one of COMP 1510 or 1001 or PHYS 2820, and one of PHYS 2053 or CHEM 2301 (contact me if you are interested in the course but don't have the pre-requisites).
Office hours: Wednesdays 10-12am (C1061).
Course material: The main textbook will be *Physical Biology of the Cell* by Rob Phillips, Jane Kondev, Julie Theriot and Hernan G. Garcia. Garland Science. Second Edition (2013). A physical copy has been put on reserve at the library (another copy has been ordered).
Desire2Learn: We will use D2L (Brightspace) for course information, grades, additional reading material.
Course outline: In this course you will learn how concepts and tools from physics can be applied to understand biological processes. A central aspect of the course is the use of *simple but quantitative* models to gain insight into various kinds of biological processes at the cellular and molecular levels. For this we will draw on various kinds of physics, for example, electrostatistics in salty solutions (the Poisson-Boltzmann equation), friction in fluids, the Einstein relation, polymer physics, random walks and diffusion, conformational entropy and depletion forces. We will cover topics such as the length, time and energy scales in biological systems, mechanical and chemical equilibrium in living cells (can we invoke equilibrium?), ligand-receptor binding, ion channels, structure of biomolecules, persistence length, single-molecule mechanics, and biological membranes

Evaluation:

Homework (40%)
Midterm quiz (25%)
In-class problems (15%)
Course project (20%)

Note that there will be extensive course work during the semester (more than in other classes) but also no final exam.

Homework: There will be around 5 homework assignments (roughly one every two weeks). These will consist of problems from the course textbook or designed by me. Some of the problems will require computational tasks such as using databases, plotting and data fitting. No programming will be required. Your solutions must be written so that anyone can follow them, i.e., you must include a clear description of the logic behind your calculations (with words) and indicate the assumptions and approximations used. Solution are to be handed in during class on the due date.

In-class problems: Lectures will include in-class problems and exercises followed by class discussion. It is therefore essential that you do the assigned readings (and think about the material) before each class. Peer- (or self-) assessment might be used for these problems.

Midterm test. There will be one midterm quiz that will test your knowledge on both quantitative and conceptual aspects of the material. Midterm is tentatively scheduled for February 12.

Course project. For this part, students will be divided (or you can self-organize) into teams of two. Each team will complete a study narrowly focused on a particular topic which you are interested in. I will provide a list with suggested topics and associated bibliographies. For example, a course project can be an extension of one of the more substantial problems in the textbook, a comparison between two published research papers on your topic, or a study of a computational or theoretical model on a biological phenomenon. You are also free (and encouraged!) to come up with your own project (subject to my approval). The course project is an important part of the course and I expect everyone to have chosen a topic by Week 6, i.e., before the Winter Break. You are expected to (1) give a team presention of your project in class (max 20-25 min/team + 5min discussion) and (2) produce a high-quality *individual* written report.

Important general information from the University.
It is the student's responsibility to acquaint themselves with these items. Please read.

3. Student Code of Conduct.
http://www.mun.ca/student/conduct/

6.8.2 Exemptions From Final Examinations
http://www.mun.ca/regoff/calendar/sectionNo=REGS-0628

6.12 Academic Misconduct
http://www.mun.ca/regoff/calendar/sectionNo=REGS-0748

Accommodations for Students with Disabilities
http://www.mun.ca/blundon/accommodations/