CHM1448H5F Modelling of Biochemical Systems
Course Outline - Fall 2020
Prof. David McMillen
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Classes will be held by Zoom, initially on Fridays 11am to 1pm but later project discussions will be arranged individually.

https://us02web.zoom.us/j/85225606406?pwd=S0paeE8yOGU3dGIrcHFLK3hKVFIwUT09

An introduction to mathematical modelling of complex biological systems. The primary focus will be on biochemical kinetic models and the nonlinear dynamics that arise from them. An introduction to and survey of techniques in mathematics (especially nonlinear dynamics and stochastic processes) will be presented.

The course is a miniature research project/directed independent study course. Each student (or group of two, something you can decide during the first few weeks) will do some background reading and pick a biological system to study using computation and analysis. After a bit of lecturing right at the beginning about background material that will likely be common to all projects, we will use the remainder of the sessions as time to consult on the ongoing projects, where I can offer suggestions and advice, and point out resources useful to your individual project. The central advantage of this approach, as I see it, is that it will offer students the opportunity to pursue a variety of different approaches, each chosen to fit with their individual background: if your background is heavier in chemistry or physics or biology, we can tailor the project to emphasize aspects of your chosen system that match your skills. Everyone is expected to incorporate some mathematical modelling, of course, but a chemist might concentrate on the molecular machinery or chemical kinetics, a physicist might focus on the nonlinear dynamics or stochastic process aspects, while a biologist might go into more depth on the underlying biological mechanisms.

Textbook: *Mathematical Modeling in Systems Biology: An Introduction*, by Brian P. Ingalls (MIT Press, 2013). I will be referring to sections of the text and suggesting problems from it, so it's important to have access to the text. The text is a very clear summary of modelling approaches, so it's a valuable resource quite apart from its use as a source of assigned readings or problems: you can find all these things online, but rarely explained so clearly or so neatly collected into one place. Prof. Ingalls is perfectly OK with people using the PDF preprint version of the text that he's posted at https://www.math.uwaterloo.ca/~bingalls/MMSB/ (I've talked to him about this).

Assessment and Grading

Project proposal – 20%
Initial project report (due October 12) – 20%
Final report (due December 18) – 25%
Final presentation (to be scheduled somewhere on or around Dec. 18) – 25%
Participation/engagement (being prepared for and engaged in project discussons, etc.) – 10%