

Computational Methods in Biology (MAP 5486)

Syllabus, Spring 2008

M,W,F 10:10–11:00 104 Love Bldg.

Professor: Dr. Richard Bertram
Office Hours: M 3:00–4:00, W 11:00–12:00, F 11:00–12:00, or by appointment
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Prerequisite: MAP5485 (Mathematical Biophysics), MAP5165 (Methods in Applied Math 1) or knowledge of ordinary differential equations/dynamical systems theory, and knowledge of a computer programming language.

Text: Computational Cell Biology, by Christopher Fall, Eric Marland, John Wagner, and John Tyson (eds.). Many of the lectures will be based on other sources, such as other texts or research articles. I will provide a list of potential sources.

Course Topics: Topics include models and analysis of neurons and other excitable systems, use of phase plane and bifurcation analysis in understanding biological systems, fast and slow time scales, whole-cell models, calcium waves, phase models, and Monte Carlo methods and stochasticity.

Course Objectives: There are two themes for this course. One is dynamics. A large fraction of the work done in mathematical/computational biology involves the modeling and analysis of the temporal dynamics of biological systems. We will investigate a range of models and analysis techniques. The other theme is computation. I consider a problem computational if it is infeasible to solve by hand. We will be using computer software to analyze the dynamics of biological models. Also, developing computer software to simulate stochastic systems.

Computer Platform: Each student should have an account on the Sun computers in the mathematics graduate computer lab. If you don't have an account please see me as soon as possible. The Sun workstations in the lab are equipped with C and C++ compilers and the XPPAUT software that will be used in the course assignments.

Expectations: You are expected to attend class and participate in discussions. If you miss a class you must get notes from another student. You are expected to complete all assignments and exams.

Assignments: Periodic homework assignments will be made. You will have about 2 weeks to complete an assignment, which must be turned in on time to avoid a 20% grade reduction for late work (late assignments accepted, with penalty, within 2 days of the due date). These count a large fraction of the final grade, so you should work the problems carefully and turn in the best work possible. The assignments will often be computer intensive.

Exams: There will be a midterm exam and a final exam. The midterm exam will be on Friday, Feb. 29 and the final exam will be given on Thursday, April 24, 10:00-12:00, 104 Love Bldg. The final exam is cumulative.

Grading: Assignments count 50% of the final grade. The midterm exam counts 20% and the final exam counts 30% of the grade. The final letter grade is determined according to the following scale:

92.1–100% = A ,	90–92% = A⁻	
86.1–89.9% = B⁺ ,	82.1–86% = B ,	80–82% = B⁻
76.1–79.9% = C⁺ ,	70.1–76% = C ,	68.1–70% = C⁻
60–68% = D ,	0–59.9% = F	

Honor Code: A copy of the University Academic Honor Code can be found in the current Student Handbook. You are bound by this in all of your academic work. It is based on the premise that each student has the responsibility 1) to uphold the highest standards of academic integrity in the student's own work, 2) to refuse to tolerate violations of academic integrity in the University community, and 3) to foster a high sense of integrity and social responsibility on the part of the University community. On an exam you may not give or receive any help from a person or written material except as specifically designed acceptable. You may discuss homework assignments with other students in the class, but the work you turn in must be your own. Plagiarizing the work of others is academically dishonest and will result in a grade of 0.

American Disabilities Act: Students with disabilities needing academic accommodations should: 1) register with and provide documentation to the Student Disability Resource Center (SDRC); 2) bring a letter to the instructor from SDRC indicating you need academic accommodations. This should be done within the first week of class.