Mathematical Biology

MATH 4780/6780

Syllabus, Spring 2013, University of Georgia

Instructor: Dr. Juan B. Gutierrez
Office Hours: M, W, F 11:00–12:00, or by appointment
Office: Boyd 440
E-mail: jgutierr@uga.edu
Phone: (706) 542-2609

Eligibility: You must have the course prerequisites listed below or equivalents. In case of doubt, consult with me.

Prerequisite: For non-math students: Calculus II (MATH2260) with grade of C- or better, or successful completion of at least three credits of equivalent courses. For math students: Qualitative Ordinary Differential Equations (MATH4700).

Text: *A Fist Course in Systems Biology*, by Eberhard Voit. Supplemental reading: *Nonlinear Dynamics and Chaos*, by Steven H. Strogatz, *Essential Mathematical Biology*, by Nicholas F. Britton.

Course Objective: A large fraction of the work done in mathematical/computational biology and involves modeling and analysis of temporal dynamics of biological systems. We will study these topics in the context of parameter estimation, gene systems, protein systems, metabolic systems, signaling systems, and population systems. By the end of the class you will be competent to understand and produce a vast array of mathematical models of biological phenomena.

Topics: Topics include flows on the line, linear stability analysis, bifurcations, eigenvectors and eigenvalues of linear systems of differential equations, two-dimensional flows, phase plane, limit cycles, discrete time models, one-dimensional iterative maps, logistic maps, Liapunov exponent, chaos, and numerical solutions of dynamical systems.

Expectations: You are expected to attend class and participate in discussions. A student absent from class bears the full responsibility for all subject matter and procedural information discussed in class. Each day we will discuss some of the problems assigned during the previous class, so to get the most out of these discussions you should work as many problems as possible *the day that they are assigned*.

Exams: There will be two unit exams and a final exam. No makeup exams will be given. An absence may be excused if sufficient evidence of extenuating circumstances is provided. In this case, the final exam grade will be used as the grade for the missed exam. One week before every exam, I will distribute a practice test; if you opt to submit it for grading, it will count for 30% of your test. After your test has been graded, you can resubmit your corrected test to cut in half the penalty due to previous mistakes. **WARNING**: Making new mistakes in resubmissions could actually lower your previous grade.

Assignments: There will be a total of six interrelated projects. Early project submission is encouraged and guarantees feedback without penalty. Multiple submissions after the due date are allowed and cut the penalty due to previous errors in half. Each of the projects deals with one of the techniques covered in the class; you can resubmit your projects and cut in half the penalty due to previous mistakes. **WARNING**: Making mistakes in resubmissions might actually lower your previous grade. Frequently, I will assign homework in class; no resubmission is allowed in these small assignments.

NOTICE: Since there is homework, homework resubmission, practice test, test, and test resubmission, you will have to attack at least five times each family of problems. This level of redundancy is necessary to learn the topics covered in the class, and you are expected to comply with it.

Tentative Exam Dates: (subject to change)
Exam 1: Wednesday, February 13^{th}
Exam 2: Wednesday, March 27^{th}
Final Exam: Exam period TBD

Grading: Unit tests will count equally in the calculation of final averages (15% each). The final exam will be weighted as two unit tests. Projects will count for 30% of the grade. Small homework assignment will count for 10% of the grade. The final letter grade is determined according to the following:

92.1–100% = **A**,	90–92% = $\mathbf{A}^-$	
86.1–89.9% = $\mathbf{B}^+$,	82.1-86% = **B**,	80-82% = $\mathbf{B}^-$
76.1–79.9% = $\mathbf{C}^+$,	70.1-76% = **C**,	68.1-70% = $\mathbf{C}^-$
60-68% = **D**,	0–59.9% = **F**	

Honor Code: The academic honesty policy of the University is supplemented (not replaced) by an Honor Code which was adopted by the Student Government Association and approved by the University Council May 1, 1997, and provides: "*I will be academically honest in all of my academic work and will not tolerate academic dishonesty of others.*" All students agree to abide by this code by signing the UGA Admissions Application. 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. You have successfully completed many mathematics courses and know that on an exam you may not give or receive any help from a person or written material except as specifically designed acceptable. Out of class you are encouraged to work together on assignments, but plagiarizing of the work of others or study manuals is academically dishonest.

Americans with Disabilities Act: Students with disabilities needing academic accommodations should: 1) register with and provide documentation to the Disability Resource Center (DRC, http://drc.uga.edu/); 2) bring a letter to the instructor from DRC indicating you need academic accommodations. This should be done within the first week of class.