

SYLLABUS
BIOL 5333 section 001
Biological Modeling
Fall 2007

Tues., Thurs. 5:30-6:50
120 Life Sciences Bldg.

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[http:// www.uta.edu/biology/grover/index.htm](http://www.uta.edu/biology/grover/index.htm)

Course Project Topics Due: October 11, 2007
Course Project Drafts Due: November 13, 2007
Course Project Due: December 11, 2007
Last Class: December 7, 2007
Office Hours: Tuesday and Thursday, 1:00 PM – 3:00 PM or by appointment

Course Description: Representation of biological processes with linear and nonlinear differential and difference equations, using examples from physiology, population biology, and ecology. Topics include graphical analysis, simulation stochastic processes, chaos, and fractals.

Student Learning Outcomes: Students will learn how to use simulation models to study ecological and evolutionary processes, including programming in the C language, and visualization skills. Students will become familiar with classical and contemporary issues in theoretical biology. These objectives will be assessed through evaluations of course projects.

Course Prerequisites: Consent of the instructor

Required Textbooks and Other Materials: Readings and assignments will be based in part on: Wilson, W. 2000. *Simulating Ecological and Evolutionary Systems in C*. Cambridge University Press.

Programming for this course will be done in the C language, so a C compiler and an appropriate editor/developer program will be needed. Though there are many suitable packages available, it is my philosophy to support the use of open-source, public-domain software for research purposes. Accordingly, I recommend use of the DJGPP C compiler and associated programs. Students can also download and install this package themselves (see <http://www.delorie.com/djgpp/>), and instructions will be provided to those who are interested. This package includes an editor/developer called RHIDE that is useful for writing and compiling programs. Detailed advice and support will be provided for using this package to complete course assignments. Advice for other compilers, editors and developers will not necessarily be provided.

Some supplementary materials may be useful. Two books will be on reserve at the Science and Engineering Library: *Ecological Dynamics* by Gurney and Nisbet, and *Modeling Biological Systems* by Haefner. These books provide somewhat different theoretical perspectives from the course textbook, and could be a source of inspiration for course projects. It may be helpful to have access to a reference manual on the C language (there are many on the market).

Grading Basis:

Periodic homework assignments	50%
Projects	50%

Homework assignments: Homework will be assigned periodically and will count for 1/2 of the course grade. It will be designed to exercise and reinforce skills and concepts covered during the course. Most homework will require writing and using computer programs. Due dates and reporting formats for homework assignments will be specified when the homework is assigned.

Tentative Outline of Topics and Readings

Introduction to theory, models, simulation, and programming (chapter 1)
Immigration-emigration and birth-death models for populations (chapters 2 and 3)
Random numbers and visualization (chapter 4)
Two-species competition models (chapter 5)
“Large” programming projects (chapter 6)
Foraging models (chapter 7)
Numerical integration of differential equations (chapter 8)
Time permitting:
Simulating spatial patterns (chapter 9)
Optimal resource allocation (chapter 10)

Projects: Each student will complete two projects – a mini-project and a course project.

The mini-project will be assigned at the end of the second lecture topic in the course outline above. It will involve applying the programming and mathematical techniques taught in that topic to do a theoretical study of the population dynamics of an organism of your choice. A written report will be required and guidance for this will be given when the mini-project is assigned. The due date will be specified at that time.

The longer course project should address a substantive question in theoretical biology using the skills and concepts covered in this course. The project must use computer programs and simulation analyses. The project report must include a summary description of all software, verbal and graphical summaries of numerical simulation results, and a written report covering the theoretical context of the project and reviewing any published literature on the topic. Source code for all programs should be attached as an appendix. Projects will be graded based on the following criteria: originality and difficulty of the topic; suitability of programs and simulations for the research questions; thoroughness of simulations and analyses; clarity and intellectual content of the text describing the research context; and thoroughness of the literature review. A good project report will have an introduction stating the research questions and briefly setting the theoretical context, a description of programs and simulation protocols, a presentation of detailed numerical and simulation results, and a discussion of the findings and an evaluation of the conclusions in light of previous literature.

All students must choose a project topic and report it to the instructor in writing by October 11, 2007. Suggestions for project topics will be made during the first several weeks of the course. However, I encourage students to pursue projects related to their own research interests. A rough draft / progress report on the course project will be due November 13, 2007. Guidance for this report will be given in class. Feedback on project progress will be given in class on November 15, 2007. There will be no class on November 20, 2007 (the Tuesday before Thanksgiving). The course project will be due on December 11, 2007.

Collaboration: Cooperating with one another is an excellent way to learn programming and other computer skills without experiencing undue frustration. Therefore you are free to collaborate to accomplish programming tasks required for homework assignments and course projects. However, each student should write their own homework and project reports in their own words. All work turned in for this course should be consistent with university rules on academic integrity, ethical practices of scientific research and communication, and commonsense practices of courtesy and effective learning. You should know that learning how to program requires that you spend some time writing code and compiling and executing programs, just like learning a new language requires that you spend a lot of time hearing, speaking and writing it. Thus you should spend a lot of time doing things yourself, even if you get frequent hints and tips from others.

Examinations: There are no exams for this course; grades will be based on only on homework assignments and projects. There is no extra credit in this course.

Late work: It will probably be possible to tolerate late work in most instances, but you should discuss any problems in completing work with the instructor at the earliest possible date. To avoid an incomplete grade, all course work must be turned in by the scheduled date of the final examination.

Attendance policy: Students who habitually miss class tend to perform poorly. Attend class regularly to get the full benefits of your tuition payments.

Tardiness: I intend to start classes on time. Arriving late disturbs other students already present and disrupts the learning process. Please be considerate and plan to be on time.

Cell phones: Please remember to turn off audible cell phones and pagers during class.

Incomplete grades: A grade of X (incomplete) may be assigned for a course if, in the opinion of the instructor, there are extenuating documentable circumstances which prevent the student from completing the required work within the semester of enrollment for the course. Incomplete grades must be made up according to current university policies as specified in the graduate and undergraduate catalogs. Failure to turn in assignments and projects on time may result in the report of an incomplete grade.

Make-up Exam Policy: There are no exams in this course.

Grade Grievance Policy: Students with questions or concerns about grading should speak first with the course instructor. If matters are not resolved, grievances may be taken to the Biology Department for resolution according to university policies.

Student Evaluation of Teaching: Student evaluation of teaching effectiveness will be conducted at the end of the semester in accordance with University policies and using forms approved and provided by the University.

Important University Policies:

Americans With Disabilities Act:

The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 92-112 - The Rehabilitation Act of 1973 as amended. With the passage of federal legislation entitled Americans with Disabilities Act (ADA), pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty of their need for accommodation and in providing authorized documentation through designated administrative channels. Information regarding specific diagnostic criteria and policies for obtaining academic accommodations can be found at www.uta.edu/disability. Also, you may visit the Office for Students with Disabilities in room 102 of University Hall or call them at (817) 272-3364.

Academic Integrity:

It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University.

"Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts." (Regents' Rules and Regulations, Series 50101, Section 2.2)

Student Support Services Available:

The University of Texas at Arlington supports a variety of student success programs to help you connect with the University and achieve academic success. These programs include learning assistance, developmental education, advising and mentoring, admission and transition, and federally funded programs. Students requiring assistance academically, personally, or socially should contact the Office of Student Success Programs at 817-272-6107 for more information and appropriate referrals.

Final Review Week:

A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week unless specified in the class syllabi. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. Classes are held as scheduled during this week and lectures and presentations may be given.

Drop for non-payment of tuition:

If you are dropped from this class for non-payment of tuition, you may secure an Enrollment Loan through the Bursar's Office. You may not continue to attend class until your Enrollment Loan has been applied to outstanding tuition fees.

Bomb Threats:

If anyone is tempted to call in a bomb threat, be aware that UTA will attempt to trace the phone call and prosecute all responsible parties. Every effort will be made to avoid cancellation of presentations/tests caused by bomb threats. Unannounced alternate sites will be available for these classes. Your instructor will make you aware of alternate class sites in the event that your classroom is not available.

Official E-mail notices:

The University of Texas at Arlington has adopted the University email address as an official means of communication with students. Through the use of email, UT-Arlington is able to provide students with relevant and timely information, designed to facilitate student success. In particular, important information concerning registration, financial aid, payment of bills, and graduation may be sent to students through email.

MavMail:

All students are assigned an email account and information about activating and using it is available at www.uta.edu/email. New students (first semester at UTA) are able to activate their email account 24 hours after registering for courses. There is no additional charge to students for using this account, and it remains active as long as a student is enrolled at UT-Arlington. Students are responsible for checking their email regularly.

After Hours Safety Escort:

The Sam Mav Escort service provides a service to assist students, faculty, staff and campus visitors to reach their destinations after regular business hours. The hours of service are 7:00 p.m. to 1:00 a.m., Sunday through Saturday. 817-272-3381.