MATHEMATICS 5354
BIOMATHEMATICS I
FALL 2016

This course is co-taught by Dr. Linda Allen and Dr. Angela Peace.

Dr. Linda Allen will cover the first half of the course (August 29 – October 19).
Professor: Dr. Linda Allen; Office: Math 117 I; Main Office Phone: 806-742-2580
Office Hours: MW: 1:00 p.m.–1:50 p.m., TR: 11:00 a.m.–12:00 p.m., or by appointment.

Dr. Angela Peace will cover the second half of the course (October 24 – December 14).
Professor: Dr. Angela Peace; Office: Math 243; Math Office Phone: 806-834-1014
Office Hours: MW: 12:30 p.m.–1:30 p.m., 3:30 p.m.–4:00 p.m., or by appointment.

Class Meeting Time and Room: MW: 2:00 p.m.–3:20 p.m., Math 115

Course Websites: L. Allen: www.math.ttu.edu/∼linallen/Math5354Fall2016.html
A. Peace: www.math.ttu.edu/∼anpeace/MATH5354.html

Textbook: *An Introduction to Mathematical Biology* by LJS Allen and supplementary material.

Main Topics Covered:
Chapter 1: Linear Difference Equations
Chapter 2: Nonlinear Difference Equations
Chapter 3: Biological Applications of Difference Equations*
Chapter 4: Linear Ordinary Differential Equations
Chapter 5: Nonlinear Ordinary Differential Equations
Chapter 6: Biological Applications of Differential Equations*
Chapter 7: Partial Differential Equations
*selected topics

Expected Learning Outcomes: The goal of this course is to become familiar with various mathematical modeling techniques important in the formulation and analysis of the dynamical behavior of biological processes: population growth, epidemics, spatial spread, biochemical kinetics, etc. that exhibit stable equilibria, cyclic behavior, bistability, hysteresis, chaos, excitability, etc. Students will learn how to model the dynamics of biological systems using difference equations and ordinary and partial differential equations. Students will review basic techniques in solving linear equations and learn new analytical techniques to study nonlinear equations, including identification of equilibrium solutions, linear stability analysis, global stability analysis, cyclic behavior and bifurcation theory. Students will learn techniques applicable to autonomous and nonautonomous systems and learn the significance of periodic and traveling wave solutions in biological applications. Some well-known biological models will be studied including Lotka-Volterra predator-prey system, Nicholson-Bailey host-parasitoid system, SIR epidemic models, Leslie's age-structured model, Fisher's model for the spread of genes. Students will also learn about more recent models such as an HIV-AIDS model, biochemical circuits and genetic switches. Students will use software such as Maple and MatLab to analyze complex behavior and to plot numerical solutions of the models.

Methods of Assessment of Learning Outcomes: Continuous formative assessment of the progress of the course will occur via ongoing communication between the instructor and the students. To this end, all students are encouraged to ask questions during class and to seek the instructor's help outside of class when needed. Formal assessment occurs through exams, homework, written and oral project and attendance. (See descriptions below.)

Exams, Homework, Project: There will be two exams. Homework will be assigned each day and collected on Wednesday. A written and oral project on a topic of your choice is required. Suitable projects can be found in the mathematical biological literature and must be approved by the instructor. Techniques for model analysis and simulation must relate to techniques learned in this course. The grade for the course will be based on exams, homework, oral and written project and attendance. There will be no make-up on exams, homework or projects except in cases of illness or participation in a university-sponsored event.

Assessment: The assessment of student progress includes: (1) Two exams (50%), (2) Homework (30%), (3) Project (20%), (4) Attendance (borderline grades).

Assignment	**Date**
Exam 1	Monday, October 10
Abstract	Wednesday, November 2
Exam 2	Wednesday, November 9
Written Project	Wednesday, December 7
Oral Presentation	Wednesday, December 14 (4:30 p.m.-7:00 p.m.)

Important Dates and Facts:

1. Monday, September 5, Labor Day
2. Wednesday, September 14, Last day of student-initiated drop **without** academic penalty
3. Wednesday-Sunday, November 23-27, Thanksgiving vacation
4. Monday, October 31, Last day of student-initiated drop **with** academic penalty
5. Wednesday, December 7, Last day of classes
6. **Civility in the Classroom**: Texas Tech University is a community of faculty, students, and staff that enjoys an expectation of cooperation, professionalism, and civility during the conduct of all forms of university business, including the conduct of student–student and student–faculty interactions in and out of the classroom. Further, the classroom is a setting in which an exchange of ideas and creative thinking should be encouraged and where intellectual growth and development are fostered. Students who disrupt this classroom mission by rude, sarcastic, threatening, abusive or obscene language and/or behavior will be subject to appropriate sanctions according to university policy.
7. **Academic Integrity**: It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension. Scholastic dishonesty includes, but it not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.
8. **Observance of Religious Holy Day**: "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code 11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. A student who is excused may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.
9. **Accommodation of Students with Disabilities**: Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructors office hours. Please note: instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services in West Hall or call 806-742-2405.