

MATHEMATICS 4000 H01
Biomathematics for Undergraduates
Spring 2019

Professor: Dr. Angela Peace

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Office: Math 243 **Office Hours:** MF: 11:00-12:30

Class Meeting Time: MWF: 10:00 -10:50

Class Room: MATH 010

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

Main Topics Covered:

Chapter 4: Linear Ordinary Differential Equations

Chapter 5: Nonlinear Ordinary Differential Equations

Chapter 6: Biological Applications of Differential Equations

Expected Learning Outcomes: The goal of this course is to introduce students to mathematical modeling techniques in the life sciences. Students will learn how to formulate and to analyze mathematical models by applying mathematical techniques studied in this course. The models will take the form of ordinary differential equations, whose dynamics change over time and/or space. Students will learn to (1) formulate differential equation models that describe population growth, competition, predation, and spatial spread, (2) calculate steady-state solutions of the models, (3) apply methods for analyzing local and global behavior of the models, (4) apply phase plane methods for systems of two ordinary differential equations, and (5) apply principles of bifurcation theory. Some classic and recent applications from the life sciences will be studied in detail, such as population growth with harvesting, drug treatment models, cellular dynamics of an infection within a host, predator-prey and competition dynamics, and spread of disease in a population. Computer technology, Maple and MatLab, will be used for some of the analysis and for numerical solution of the mathematical 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 and regularly assigned homework. 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, and the projects. 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 two exams, weekly homework, and a research project.

Assignment	Portion of Grade
Exam 1	25%
Exam 2	25%
Homework	25%
Research project	25%

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.

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 is 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.

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.

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.