Professor: Dr. Wenjing Zhang; Office: Math 214; Math Office Phone: 806-742-2580; Email: wenjing.zhang@ttu.edu

Office Hours: Fridays at 2pm-5pm or by appointment.

Class Meeting Time and Room: MWF 9:00-9:50am, Math 013

Course Website: BlackBoard

Textbook: An Introduction to Mathematical Biology by L. J. S. Allen and supplementary textbooks and articles.

> https://www.amazon.com/gp/offer-
> listing/0130352160/ref=tmm_pap_used_olp_sr?ie=UTF8&condition=used&qid=&sr=

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, NicholsonBailey 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 Mondays. 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 will include (1) Two exams (50%), (2) Homework (30%), (3) Project (20%), (4) Attendance (borderline grades).

1. Homework will be assigned each day and collected on Mondays.
2. Exam 1 : Chapter 1&2

3. Exam 2: Chapter 4&5
4. Abstract of the project: Early Novermber
5. Written Project : Early December
6. Oral Presentation: December 3 & 5 in Class

Important Dates and Facts:

1. Monday, September 3: Labor Day holiday
2. Monday, October 29: Last day for student-initiated drop with penalty
3. November 21-25: Thanksgiving holiday
4. Wednesday, December 5: Last day of classes
5. Civility in the Classroom: Texas Tech University endeavors to foster a classroom climate of mutual respect among students and between students and teacher. Mutual respect means that we should be tolerant of different ideas and varying opinions about topics of discussion in class, that we address each other respectfully and without interrupting while others are speaking, and that we do not engage in disruptive behavior in class. Signs of disrespect include, but are not restricted to: ringing cell phones (students must turn them off or leave them home), reading a newspaper or other material that is not part of a class assignment while in class, talking with classmates during class, eating and drinking in class, and similar disruptive behaviors. Students who engage in disruptive behavior will be warned. Repeated disruptive behavior may result in the student being asked to leave the classroom.
6. Academic Honesty: The TTU Code of Student Conduct, which you should have received when you enrolled in the university, contains a lengthy list of prohibited behaviors, among which is Academic Dishonesty. Please note that cheating and plagiarism (a form of cheating) are included among the actions that are subject to disciplinary action. Plagiarism: The appropriation or imitation of the language, ideas, and thoughts of another author, and representation of them as ones original work. The Random House College Dictionary, revised edition. New York: Random House, 1975, p. 1014. 1. The use, by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgement; 2. the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials. Student Affairs Handbook, Texas Tech University, Lubbock, Texas, 1998-99, p. 22. Plagiarism and cheating are not tolerated and will result in a grade of 0 on exams or on work that contains plagiarized material. In addition, a grade of F may be awarded for the course. Any cases of plagiarism or cheating will be reported to the Honors College and the responsible academic dean (i.e., Arts & Sciences, Business Administration, Engineering, etc.) for such disciplinary action as they see fit to administer.
7. 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, you may contact the Student Disability Services office in 335 West Hall or 806-742-2405.
8. Student Absence for Observation of Religious Holy Days: A student who is absent from classes for the observation 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 if, not later than the fifteenth day after the first day of the semester, the student had notified the instructor of each scheduled class that the student would be absent for a religious holy day.