

# **MAT 452 - Introduction to Chaos and Nonlinear Dynamics, Fall 2017**

## **Instructor**

**Hal Smith.** <http://math.la.asu.edu/halsmith>

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Office Hours: TBD, or by appt.

**Class:** line #:71363

Day & Time: T & Th 10:30-11:45;

Place: WCLR 108

## **Course Description**

This is a course on nonlinear dynamical systems with applications to the natural sciences. Dynamical systems arise from the iteration of a function (discrete time) and from differential equations; we will consider both types. Stability of equilibria, oscillations, and phase plane analysis are covered. Bifurcations, i.e., changes in the behavior of the solutions of such systems, as parameters change, will be emphasized. Examples will show that chaos, the complicated, aperiodic behavior of generic solutions, with sensitive dependence of solutions on initial data is possible and common in dynamical systems in higher dimensions..

**Prerequisites :** MAT 274 or 275 with C or better; MAT 242, 342, or 343 with C or better; MAT 371 is recommended.

**Text :** Nonlinear Dynamics and Chaos, 2nd ed., by S. Strogatz.

## **Grading**

**Homework (100 pts), a midterm exam (100 pts), and a final exam (150 pts) will determine the course grade. Homework will be collected every Thursday. Late homework will not be accepted!**

A written student-initiated project may replace the final exam but only if all of the following conditions are met:

- Student and instructor agree on focus of the project and a written outline is submitted before the midterm exam.
- Student meets with instructor bi-weekly to discuss progress on project following the midterm exam.
- Student agrees to accept instructor suggestions, made during bi-weekly meetings, concerning the project.
- Project will include scientific background, computer simulations, and use a significant body of the mathematics from the course.

*While the instructor is open to preliminary discussions concerning the focus of the project, it is the student's responsibility to arrive at a topic. A written project should not be viewed as avoidance of the final exam since more work will be required for a successful project..*