MATH 417: Qualitative Theory of Ordinary Differential Equations

Instructor: Alberto Bressan - Spring 2014

Meeting time: Tuesday-Thursday 11:15 - 12:30, Thomas 117.


The course will cover the following main topics:

- One dimensional flow
- Stability, bifurcations
- Linear systems of differential equations
- Nonlinear autonomous systems in the plane
- Limit cycles
- Bifurcations of planar systems
- Introduction to chaotic dynamics

GRADING will be based on Homework 40%, Midterm exams 30%, Final exam 30%.

OFFICE HOURS: McAllister 201, Wednesdays 9:30–11:00. Other times can be scheduled by appointment.

HOMEWORK will be collected each week on Thursdays, at the end of the class.

Calendar

Jan 13: classes begin
Feb. 27: Midterm Exam 1 (in class)
March 9–15: Spring Break, no classes
April 10: Midterm Exam 2 (in class)
May 2: classes end
May 5–9: Final Exam (yet to be scheduled)
Sections covered each week (tentatively)


Feb. 4–6: 3.2–3.4.  Different types of bifurcations for flows on the line.

Feb. 11–13: 5.0–5.2.  Linear systems in the plane.

Feb. 18–20: 6.0–6.3.  Introduction to phase plane analysis of nonlinear systems.

Feb. 25–27:  Review, Midterm Exam 1 (covering Sections 2, 3, 5).


April 8–10:  Review, Midterm Exam 2 (covering Sections 6, 7).

April 15–17: 8.0–8.2.  Bifurcations in nonlinear planar systems.

April 22–24: 9.0–9.2.  Introduction to chaotic dynamics. The Lorenz equations.

April 29 - May 1: 9.3.  Chaos on a strange attractor. Review.
Homework assignments (from the textbook):

Due date:

**Jan. 30:** 2.1.1, 2.1.2, 2.1.3, 2.2.1, 2.2.3, 2.2.8, 2.2.9, 2.2.10, 2.4.4, 2.5.1.

**Feb. 6:** 2.7.1, 2.7.4, 2.8.2, 2.8.3, 3.1.1.

**Feb. 13:** 3.2.1, 3.2.4, 3.4.1, 3.4.4, 3.4.11, 3.4.16.

**Feb. 20:** 5.1.1, 5.1.2, 5.1.4, 5.1.5, 5.1.7, 5.2.1, 5.2.3, 5.2.11.

**March 6:** 6.1.1, 6.1.2, 6.1.6, 6.1.8, 6.1.9, 6.1.12, 6.1.13, 6.3.1, 6.3.2, 6.3.9, 6.3.13.

**March 20:** 6.4.1, 6.5.1, 6.5.4, 6.5.8, 6.5.11, 6.6.1, 6.6.2, 6.6.5, 6.6.7.

**April 3:** 7.1.1, 7.1.5, 7.1.8, 7.2.1, 7.2.2, 7.2.3, 7.2.5, 7.2.7, 7.3.1, 7.3.3.

**April 17:** 7.3.5, 7.3.10, 7.4.1, 7.5.1.

**April 24:** 8.1.1, 8.1.2, 8.1.3, 8.1.6, 8.1.9, 8.2.1, 8.2.2, 8.2.5, 8.2.8.
Academic Integrity Policy

All Penn State Policies regarding ethics and honorable behavior apply to this course.

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University’s Code of Conduct states that all students should act with personal integrity, respect other students’ dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts. Academic integrity includes a commitment not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

From Policies and Rules, Student Guide to the University Policy 49-20: Academic dishonesty includes, but is no limited to, cheating, plagiarizing, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with academic work of other students. A student charged with academic dishonesty will be given oral or written notice of the charge by the instructor. If students believe that they have been falsely accused, they should seek redress through informal discussions with the instructor, the department head, dean or campus executive officer. If the instructor believes that the infraction is sufficiently serious to warrant the referral of the case to Judicial Affairs, or if the instructor will award a final grade of F in the course because of the infraction, the student and instructor will be afforded formal due process procedures.

Based on the University’s Faculty Senate Policy 49-20, a range of academic sanctions may be taken against a student who engages in academic dishonesty. Please see the Eberly College of Science Academic Integrity homepage for additional information and procedures.