

## MATH 8440: ADVANCED ORDINARY DIFFERENTIAL EQUATIONS FALL 2021

This is an introductory graduate-level course on dynamical systems. The core material consists of the following topics:

- Local existence/uniqueness of solutions to initial value problems
- Continuation of solutions
- Linear systems with constant coefficients
- Floquet theory
- Stability of rest points and Lyapunov functions
- Grobman–Hartmann theorem
- Stable/unstable/center manifolds
- Poincaré map and stability of periodic orbits
- Hopf bifurcation.

Time allowing, we will hopefully touch upon additional subjects.

**Textbook.** The main reference is *Ordinary Differential Equations with Applications* by C. Chicone; any edition will suffice. You may find it helpful to also consult *Ordinary Differential Equations and Dynamical Systems* by G. Teschl on occasion.

**Prerequisites.** MATH 4700/7700 or equivalent. Prior exposure to some topics in functional analysis (for example, Banach spaces) is desirable but not required.

**Structure of the course.** This is a graduate course, so much of the responsibility for learning the material will rest on you. We will have three lectures a week, MWF 3-3:50PM in Strickland 219. These will be in person and synchronous. If the University determines it is necessary, we will switch to an asynchronous online format.

There will be semi-regular homework, typically assigned once every other week. You are free — and encouraged — to collaborate on them, but each student must submit their own work. I strongly prefer the assignments to be typeset in LaTeX (or Word if absolutely necessary). In total, the assignments will determine 80% of your course grade. The homework must be submitted through the course Canvas page.

The remaining 20% will consist of a take home final exam. It will be released on our last day of class (**Wednesday, December 8th**) and due one week later (**Wednesday, December 15th**). Unlike the homework, the final exam must be completed individually.

**Office hours.** I will hold regular office hours on Wednesday 4:00-5:00PM and Thursday 2:00-3:00PM, in MSB 307. If you are not available at this time, we can make a special appointment.

**University Policies.** University policies regarding COVID-19; Academic Integrity; Recording in the Classroom; FERPA; Intellectual Pluralism; Netiquette; Religious Holidays and Accommodations; Nondiscrimination; and Disability Accommodations can be found here: <https://provost.missouri.edu/faculty-affairs/syllabus-information/>