

Math 8501, 3 Credits, Fall 2018

Theory of Ordinary Differential Equations

— *Syllabus* —

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Time & Place

MWF 11:15 – 12:05, VinH 213

Material Covered

This is a two-semester course in dynamical systems and differential equations. We will cover basic ODE concepts, such as existence and differentiability of solutions, and then look at ODEs from a dynamical systems perspective. We'll look at stability, bifurcations, invariant manifolds, normal forms, singular perturbations, chaotic dynamics, invariant measures, and statistical properties. I'll try to take both a theoretical (classification!) and an applied (computability!) perspective.

Prerequisites

This is a proof-based class, familiarity with rigorous proofs and abstract concepts are necessary. Some prior exposure to elementary concepts of functional analysis (what's a Banach space, when is a linear operator invertible, . . .) will be useful (but can be acquired on the way). The class will be more useful for students willing to explore dynamical systems numerically, some experience with Matlab is useful.

Text

No textbook is required; taking notes in class is necessary. I will try to provide notes as we move along. Books that cover some of the content of the first semester are

- Chicone, Carmen. *Ordinary differential equations with applications*. Texts in Applied Mathematics, **34**, Springer-Verlag, New York, 1999.
- Perko, Lawrence. *Differential equations and dynamical systems*. Texts in Applied Mathematics, **7**, Springer-Verlag, New York, 2001.
- Amann, Herbert. *Ordinary differential equations. An introduction to nonlinear analysis*. de Gruyter Studies in Mathematics, **13**, Walter de Gruyter & Co., Berlin, 1990.

Office Hours

MWF 9:05 – 9:55, VinH 509 or by appointment.

Contact

All material regarding the course, in particular homework assignments, can be found on my homepage <http://www.umn.edu/~scheel>. Everybody is encouraged to ask questions at any time, during or after the lecture at office hours, or by appointment. Best way to reach me is email to scheel@umn.edu.

Homework

Homework will be assigned on Fridays and will be due the next Friday before the lecture. Students may work together on the homework. However, they must write their homework individually, in their own words.

Composition of Grade

Homeworks 100%