

MA775 - Ordinary Differential Equations - Spring 2014

Contact Info

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Class details:	11-12 MWF, PSY B39

Grading

Graded Item	Weighting	Date
Homework	70%	Assigned every 1-2 weeks
Final Project	30%	Due date Wednesday, May 7

Textbook and topics covered

The main book we will use is “Ordinary Differential Equations with Applications,” by Carmen Chicone, which is available online through the BU library as an electronic resource. Another good book that covers much of the same material is “Differential equations and dynamical systems,” by Lawrence Perko, which is available as a physical book from the BU library.

The basic plan for the course is: (1) Introduction: existence and uniqueness, flows, first examples; (2) Linear Theory: fundamental solutions, matrix exponentials (semigroups), spectral theory, Floquet theory, exponential dichotomies; (3) Local Nonlinear Theory: invariant manifolds, Hartman-Grobman, Poincaré maps; (4) Global Nonlinear Theory: Poincaré-Bendixson, Lyapunov functionals and gradient flows, Hamiltonian dynamics; (5) Bifurcations: saddle node, pitchfork, transcritical, Hopf, normal forms; (6) Additional topics (if time): forced oscillations, averaging, Melnikov theory, Poincaré maps, extensions in infinite dimensions.

Homework

Homework assignments will be given approximately every 1-2 weeks. You are encouraged to work together on these, but please make sure that you write up the solutions on your own.

Final Project

You should select a topic that has not been covered in class, read about it on your own, and write up a brief (5-10 pages) introduction to the topic. The references that you use for this project could include things like additional chapters of Chicone or Perko (or another book), or a research article. Your write up should be at a level accessible to your classmates and could include things like why the topic is interesting, what the basic ideas or key points are, major theorems related to the topic (and sketches of proofs, if appropriate), and examples where the theory/topic is used. It should not simply be a paraphrasing of one single resource. Once you've chosen your topic, please let me know so I can confirm the topic is suitable.