

**Course Outline**  
**Mathematics 5420-1**  
**Introduction to Differential Equations**  
**Spring 2008**

**Time and Place:** 5420-1 MWF 9:40am, 222 LCB

**Instructor.** Professor Grant B. Gustafson, JWB 113, 581-6879 <sup>1</sup>

**Email.** [ggustaf@math.utah.edu](mailto:ggustaf@math.utah.edu)

**WWW page.** Open the site <http://www.math.utah.edu/~gustafso/> where you will find any additional material for 5420.

**Office Hours.** MWF before class, and other times by appointment. You are welcome to drop in any time I am free or call at strange hours. Specific questions by email are welcome (like “Will you be in tomorrow at 3pm?”). I am unavailable after class MWF. On Tuesday-Thursday, please call or write email if possible, as a drop-in may not work.

**Required Text.** Robinson, R. Clark, *An Introduction to Dynamical Systems: Continuous and discrete*, Pearson / Prentice Hall, New Jersey 2004, ISBN 0-13-143140-4.

**Additional Non-required Texts:**

Birkhoff and Rota, *Ordinary Differential Equations*, Fourth Edition, Wiley, NY (1989), 0-471-86003-4.

Brauer and Nohel, *The Qualitative Theory of Ordinary Differential Equations*, Dover, 0-486-65846-5. Reprint of the 1969 edition. P.Waltman, *A Second Course in Elementary Differential Equations*, Academic Press, NY (1986), ISBN 0-12-733910-8.

D.Sanchez, *Ordinary Differential Equations and Stability Theory*, Dover Publishers, ISBN 0-486-63828-6.

W.E.Boyce and R.C.DiPrima, *Elementary Differential Equations*, Fifth Edition, Wiley, NY (1992), 0-471-50997-3.

Borrelli–Coleman, *Differential Equations: A modeling approach*, John Wiley and Sons (1998), ISBN 0-471-04230-7.

**Prerequisite:** Assumed is the first 7 chapters from Cushing’s text *Differential Equations: An Applied Approach*, Prentice-Hall / Pearson, New Jersey 2004. A basic course in matrix theory, like 2270, is assumed both in the lectures and in the textbooks.

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<sup>1</sup>Pronunciation: In the phrase *Gust of Wind* change *Wind* to *Sun*.

**Course Content.** The course will consist of seven chapters, as follows.

- Chapter 1. Intro to DE
- Chapter 2. Linear Systems
- Chapter 3. Flow
- Chapter 4. Phase Portraits
- Chapter 5. Phase and Lyapunov Theory
- Chapter 6. Periodic Orbits
- Notes www Poincaré-Bendixson
- Chapter 7. Chaotic Attractors

The lectures will be guided by Robinson's book. Details are to be supplied by the participants in volunteer lectures.

**Grading Policy.** Final grades will be based on volunteered lectures and participation. No midterms and no final exam.

**Computing Equipment.** Work is done either on existing computer accounts or personal computers that may be available to students, or on Math Dept UNIX accounts which are issued on registration. The user name and password rules are posted in the lab in LCB. For operating hours, please consult the mathematics department in 233 JWB (581- 6851) or ask one of the lab instructors in LCB. The schedule is posted on bulletin boards near 233 JWB and also on Angie Gardener's door. Currently, it is 8:00am to 8:00pm daily except weekends, closing 4pm on Friday.

Modem access to the mathematics department unix machines can be made via the campus network. Access numbers are 924-0639 (15 min pool) and 924-0783 (1-hour pool). A valid UofU ID card is required to use this facility. The modem access user name is your Registrar's web site user name u00xxxxxx. The password matches the registrar's site password. To install modem support for Windows, Linux or OS-X, follow the advice given by the campus computing web site.

After connection, use secure telnet (program `putty` is free) with address `xserver.math.utah.edu`. In this environment X-windows is unavailable, but you may run tty interface programs like `mm`, a mail program, and `maple`, the tty-interface version of `xmaple`.

What is outlined here of course works also for connections from ADSL modems and campus access. Faster connections can use gui-interface programs like `xmaple`, provided X-windows support exists on the client machine (Linux, OS-X and Vista Ultimate have it).