MATH 252 - ELEMENTARY DIFFERENTIAL EQUATIONS - SYLLABUS

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Office Hours: F 16:30-17:30 online, W 16:30-17:30 HILL 524 (tentative)

Meetings: M 15:00-16:20 online, W 15:00-16:20 SEC-111

Textbook

The textbook for this class is Blanchard, Devaney, Hall, *Differential Equations*, 4th edition, published by Brooks/Cole. There are fairly substantial differences with the earlier editions, but you could potentially make do with the 3rd (be careful of homework problem and section numbering, though). The text is very expensive if you buy a new copy, but used or electronic copies are at least somewhat more affordable. You do not need a new copy, and you do not need the software key new copies are sold with.

Prerequisites

The official prerequisites for this class are Math 250 and Calculus 3 (usually Math 251). We will use linear algebra extensively, with rather minimal review; be prepared.

Contact Information

Tentatively, I will have scheduled office hours at 14:30 online on Fridays and in person in my office, Hill 524 (very close to the classroom), on Wednesdays. If this proves inconvenient, unreasonable, unsafe, etc., I may modify the times and format. You can contact me by email anytime.

Topic

The course is an introduction to ordinary differential equations and modeling. We will cover Chapters 1-5 in the textbook with a few exclusions.

Class Structure

- We will be using Canvas extensively for all class material.
- On Mondays, the class meeting will be online, via Zoom. I will prioritize computer demonstrations on these days. This will be recorded and made available on Canvas as well.
- On Wednesdays, the class meeting will be in person.
- There will be short quizzes at the beginning of Monday's class, in Canvas. They will be worth 10% of the grade.
- There will be weekly homework problems assigned, due Monday at 15:00. This will be worth 20% of the grade.

- There will be two midterm exams (20% each) and a final exam (30%).

Software

We will be using MATLAB routinely during this course. You will not be expected to master the software, but if you have never used it before you will need to take a few hours to learn how to operate it at a basic level. I will provide demonstrations and sample code during lectures when relevant. MATLAB also has quite good documentation.

MATLAB is potentially expensive, but you have complete access to it through Rutgers. Go to `https://software.rutgers.edu/product/3554` and click on the big link there. You will need to sign up for a MathWorks (the company that makes MATLAB) account using your Rutgers email. You may need to set your password again after receiving an email.

There are then two options for how to use MATLAB: you can install it on your personal computer, or you can work with it online in a browser window. Installing it may be more convenient, depending on your hardware situation. I will attempt to use the online version in my (online) lectures so that my user interface is identical to yours. None of the computations we will be doing are particularly demanding, so you should not worry about your computer's ability to handle them.

I will assign problems and projects for homework with the expectation that you will use MATLAB to do some parts of them. If you are highly proficient with other software (Mathematica, python computational packages, possibly Maple), you could potentially use that instead, but I am unlikely to be able to help you if you have difficulties.

Exams

The midterm exams will be on Wednesdays, in person. The location and format of the final will be announced later, but it will take place on December 22, 16:00-19:00. You will not be tested on MATLAB usage. If you cannot attend an exam, you must let me know in advance.

All students in the course are expected to be familiar with and abide by the academic integrity policy (`http://academicintegrity.rutgers.edu/academic-integrity-at-rutgers`). Violations of the policy are taken very seriously.

Homework

I will assign a handful of problems, often from the text. You may discuss them with others, but the written solutions must be your own. The problems may be fairly open-ended and allow you some latitude in what to do; expect them to take some time and require careful and well-reasoned written answers. Most of them will not be routine computational exercises.

Homework will be turned in via Canvas online, but not through the main Canvas course page. Exact instructions will be given. Late homework will not be accepted.

Quizzes

There will be short quizzes at the beginning of Monday's class on Canvas; make sure you can access Canvas during class. The quizzes will generally have a couple questions on material

from the previous week and one question on anything covered at any point. I will drop the two lowest quiz scores, but there will be no make-ups.

Technology

More information about technology:

- Monday class and office hours will be held via Zoom. Links to the meetings will be available on Canvas.
- You will also need to access Canvas, and are encouraged to have access to MATLAB and a microphone.
- You are encouraged (but not required) to use the webcam when in class.
- The Monday lecture portions of class will be recorded, and the recordings will be posted on Canvas. This is not a replacement for actually going to class.
- All course materials will be posted on Canvas.

Department advice on scanning documents to pdf using your phone camera: On IOS 11+, go to Notes → any note → + icon above the keyboard → Scan Document → possibly change to b/w from color by tapping icon with three circles in top row. On Android devices (with Google account linked): Google Drive → Add (bottom right) → Scan → take photo, then possibly resize or add more pages → Done.

Some possibly helpful links:

- Canvas: `https://canvas.rutgers.edu`
- Zoom: `https://zoom.rutgers.edu`
- Math department policy on tech: `https://math.rutgers.edu/academics/undergraduate/1599-technology-requirements-for-math-courses-in-fall-2020`
- University information about technology: `https://coronavirus.rutgers.edu/technology-resources-for-students/`
- Some links from the SAS: `https://sas.rutgers.edu/sas-pandemic-resources`
- MATLAB through Rutgers: `https://software.rutgers.edu/product/3554`

Learning Goals

- Relate mathematical questions to pose of differential equations to modeling goals. Be able to discuss common modeling concerns (prediction, long-time behavior, stability, dependence on parameters) in mathematical language.
- Understand various common and useful qualitative properties of differential equations.
- Relate qualitative questions to visual, analytic, and numerical approaches which may be used to answer them.
- Understand the structure of linear systems of equations with constant coefficients. Relate this to behavior of nonlinear systems near equilibria.

Schedule

The schedule below is provisional, and subject to change.

Dates	Sections
9/1	1.1
9/8	1.2, 1.3
9/13-9/15	1.4, 1.2, 1.5
9/20-9/22	1.6, 1.8
9/27-9/29	1.7, 1.9
10/4-10/6	2.1-2.3
10/11-10/13	2.4, Midterm 1
10/18-10/20	2.5, 2.6
10/25-10/27	2.7-3.1
11/1-11/3	3.2-3.4
11/8-11/10	3.4, 3.5, Midterm 2
11/15-11/17	3.6-3.8
11/22	4.1
11/29-12/1	4.2, 5.1
12/6-12/8	5.2-5.3
12/13	5.4
12/22	Final

Student Wellness Services

Counseling, ADAP & Psychiatric Services (CAPS) (848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901/ `www.rhscaps.rutgers.edu/medical-counseling-services/counseling`

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

Violence Prevention & Victim Assistance (VPVA) (848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / `www.vpva.rutgers.edu/`

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

Disability Services (848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / `https://ods.rutgers.edu/`

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: `https://ods.rutgers.edu/students/documentation-guidelines`. If the documentation

supports your request for reasonable accommodations, your campuss disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: `https://ods.rutgers.edu/students/registration-form`.

Scarlet Listeners (732) 247-5555 / `http://www.scarletlisteners.com/`

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.