Math 2410 — Elementary Differential Equations

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Instructor Information

Instructor: Ben Salisbury, Teaching Assistant
Website: www.math.uconn.edu/~salisbury
Email: benjamin DOT salisbury AT uconn DOT edu
Office: MSB 231
Office Hours: Tuesdays 11am–12pm and Fridays 9:55am–11:55am.

Course Information

Section 002: MWF 9:00–9:50am in MSB 319.
Section 004: MWF 2:00–2:50pm in MSB 311.
Course Text: *Differential Equations*, third edition, by Blanchard, Devaney, and Hall.

Introduction to ordinary differential equations and their applications, linear differential equations, systems of first order linear equations, numerical methods.

You are expected to work hard! Mathematics is a challenging subject which is best learned through practice, practice, and more practice. You are expected to read the material to be covered in class *ahead of time* so you will be better equipped to ask and answer questions during the lecture. My lectures should serve as a guide and additional explanation, as well as a venue to ask questions and receive evaluation, as *you* learn the material. Additionally, homework exercises and practice, which are addressed below, may be even more beneficial if attempted after the first reading of their corresponding section but before the class in which they are covered. This way you have an opportunity to think about the problems ahead of time and form any coherent and well-thought-out questions to be asked during class. In my experience, one of the aspects that students struggle with most, in general, is how to form the question to which they need answering.

I hope to make the class interesting to all involved. Mainly, I hope to include as many real-world examples as I can. Of course, the focus is on learning the techniques, so there will be many examples for each topic (hopefully with some class participation). I see that both classes will be meeting in high-tech classrooms, so there may be a possibility for a computer demostration or two throughout the semester, rather than the same-ole lectures. We'll see...

Course Downloads

- Quiz 1 solutions
- Quiz 2 solutions
- Ouiz 3 solutions

- *RL*-series circuits solutions
- Quiz 4 solutions (Note that the orientation in question 1 should be reversed.)
- Quiz 5 solutions
- Quiz 6 solutions
- Quiz 7 solutions
- Quiz 8 solutions

Review Sessions	
Section 002	Tuesday, May 3, at 4pm in MSB 219
Section 004	Sunday, May 1, at 3pm in MSB 219

Grading Breakdown

Homework	Due Friday after assigned	5%
Quizzes	Every Friday (except exam days)	10%
Exam 1	Friday, February 18. Covers 1.1–1.9	20%
Exam 2	Friday, March 25. Covers 2.1–2.4, 3.1–3.4	20%
Exam 3	Wednesday, April 27. Covers 3.5, 3.6, 4.1, 4.2, 5.1, 6.1–6.3	20%
Final Exam	**Section 002: Wednesday, May 4 at 8am in MSB 319** **Section 004: Monday, May 2 at 3:30pm in MSB 311**	25%

Course Outline

Week	Date
1.1	Modeling via Differential Equations
1.2	Separation of Variables
1.3	Slope Fields
1.4	Euler's Method
1.5	Existence and Uniqueness of Solutions
1.6	Equilibria and Phase Lines
1.7	Bifurcations
1.8	Linear Equations
1.9	Integrating Factors for Linear Equations
2.1	Modeling via Systems
2.2	Geometry of Systems
2.3	Analytic Methods for Special Systems
2.4	Euler's Method for Systems
3.1	Properties of Linear Systems and the Linearity Principle

3.2	Straight-Line Solutions
3.3	Linear Systems with Real Eigenvalues
3.4	Linear Systems with Complex Eigenvalues
3.5	Linear Systems with Repeated and Zero Eigenvalues
3.6	Second-Order Linear Equations
4.1	Forced Harmonic Oscillators
4.2	Sinusoidal Forcing
5.1	Equilibrium Point Analysis
6.1	Laplace Transforms
6.2	Discontinuous Functions
6.3	Second-Order Equations

Homework Assignments

There will be many homework exercises assigned for each section which, as an active participant in this class, you should attempt each one on their own and ask for help only after they have made a valiant effort. After all, you will not be able to work with anyone else on a quiz or an exam. Even though the homework constitutes only a small portion of the numerical grade, its value can not be undervalued as an essential tool to completely understand the material presented. Hence, it should be taken very seriously if one intends to succeed in this class.

In particular, you will be assigned problems from the text each Friday which you will be expected to hand in at the beginning of class the following Friday. ***No late (which includes at the end of the class) homework assignments will be accepted.*** Moreover, homework must be neat and in the order the problems were assigned. Part of being a college student is learning to be professional, so your homework should be treated as a formal report that you would hand in at a job. That is, sloppy or unreadable homework (according to the instructor's judgement) will be considered ineligible for grading and the student shall receive no credit.

Due Date	Assignment
Friday, January 28	**1.1**: 1, 2, 3, 5, 7, 8, 9, 15, 16, 20. **1.2**: 1–33 odd.
Friday, February 4	**1.3**: 1–17 odd. **1.4**: 1, 3, 5, 7, 8. **1.5**: 1, 3, 5, 6, 7, 8, 9, 14, 15.
Friday, February 11	**1.6**: 1, 3, 5, 7, 9, 11, 29, 31, 33, 35, 37, 38. **1.7**: 1, 3, 5, 9, 11, 20, 21.
Wednesday, February 16	**1.8**: 1, 3, 5, 7, 9, 11, 13, 21, 23, 32, 33. **1.9**: 1–17 odd, 21, 25. *RL*-series circuit worksheet.
Friday, March 4	**2.1**: 1–6, 7, 9–15, 20, 21, 22. **2.2**: 1–21 odd. **2.3**: 1–15, 17.
Friday, March 18	**2.4**: 1–9. (This site will help with calculations) **3.1**: 1–6, 7–15 odd, 25, 27, 29.

Wednesday March 23	**3.2**: 1–13 odd, 15–19, 21, 23. **3.3**: 1–15 odd, 19, 20, 21. **3.4**: 3–13 odd, 15–20, 23.
Friday, April 8	**3.5**: 1–9 odd, 10–13, 17, 19, 20, 21, 23. **3.6**: 1–19 odd. **4.1**: 1–19 odd, 20, 25, 27, 29, 37, 39.
Monday, April 18	**4.2**: 1, 3, 5, 7, 9, 11, 13, 15, 16, 17, 19. **5.1**: 1–7, 9, 11, 17. **6.1**: 1–7, 9, 11, 13, 15, 17, 19, 25, 27.
Monday, April 25	**6.2**: 1, 2, 3, 5, 7, 9, 11, 13. **6.3**: 1–8, 11–18.

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