

MA 320 Differential Equations

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Office Hours: Monday 3-4, Thursday 4-5, Friday 2-4, no appointment necessary. Feel free to make an appointment if you cannot come to my regular office hours.

Topics covered:

1. First order differential equations. Basic ideas.
2. Separable differential equations.
3. Direction field.
4. Numerical solutions. Euler's method.
5. Linear differential equation.
6. Homogeneous diff. eq. Bernoulli diff. eq.
7. Autonomous differential equations.
8. Modeling with differential equations.
9. Exact equations.
(Exam 1)
10. Second and higher order equations.
11. Homogeneous higher order linear equations.
12. Nonhomogeneous equations: variation of parameters.
13. Nonhomogeneous equations: the method of undetermined coefficients.
(Exam 2)
14. The Laplace transform. Definition. Properties.
15. Inverse Laplace transform.
16. Solving linear systems with Laplace transforms.
17. Transforms of discontinuous and periodic functions.
18. Delta function. Convolution.
(Exam 3)
19. Systems of first order differential equations. Phase plane analysis
20. Nonlinear systems of differential equations.
21. Modeling with systems of differential equations. Steady states and stability.
(Final Exam)

Text: No textbook is required. Handouts with new material and practice problems will be distributed for each topic.

Technology: Matlab will be used extensively. All students are also recommended to have a calculator.

Tentative Exam Schedule:

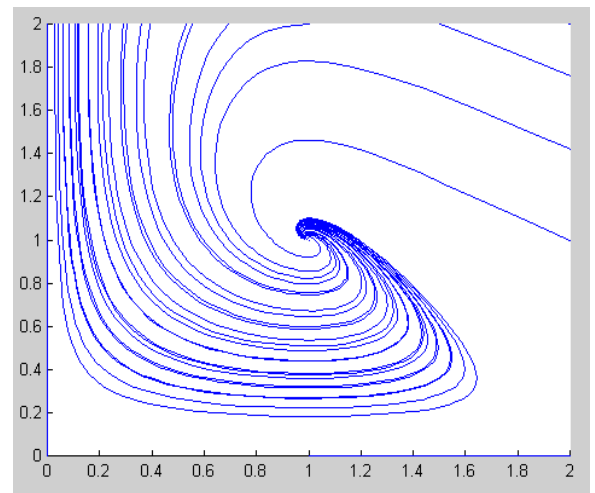
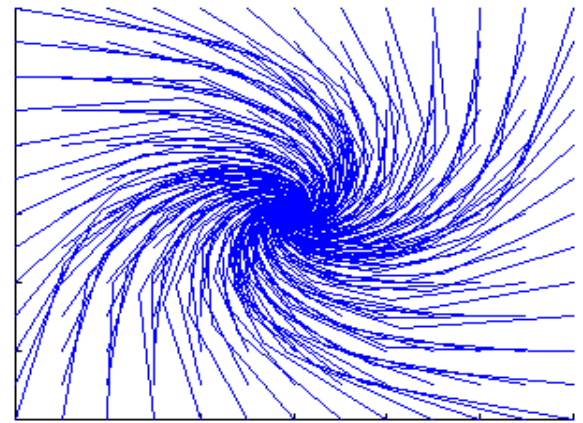
Exam 1. During week 5 (09/28)

Exam 3. During week 12 (11/16)

Exam 2. During week 9 (10/26)

Final Exam. During the finals week

Grading:



| | |
|---------------|-------------|
| 3 Exams | 18% each |
| Final Exam | 22% |
| 3 assignments | 12% |
| 3 projects | 12% |
| TOTAL | 100% |

Grades are computed according to the following system:

| letter grade | A+ | A | A- | B+ | B | B- | C+ | C | C- | D+ | D | D- | F |
|--------------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------|
| number grade | 97 to 100 | 93 to 96 | 90 to 92 | 87 to 89 | 83 to 86 | 80 to 82 | 77 to 79 | 73 to 76 | 70 to 72 | 67 to 69 | 63 to 66 | 60 to 62 | 0 to 59 |

Relevant Course Elements

- 1. Prerequisites:** Calculus 2 or the permission of instructor.
- 2. Attendance:** It is imperative that students attend all classes. Students are responsible for all material covered in class, even if attendance is not checked or assignments collected.
- 3. Course Objectives.**
 - Solve differential equations using various techniques.
 - Identify situations that require the use of differential equations, develop mathematical models involving differential equations and justify their solutions.
 - Use appropriate technology to find and examine solutions of differential equations.
- 4. Learning outcomes.** Students will:
 - demonstrate the proficiency in solving differential equations,
 - acquire knowledge of various mathematical concepts involving differential equations,
 - acquire knowledge of modeling techniques required for successful application of mathematics,
 - demonstrate the use of differential equations in problem solving,
 - demonstrate a proficiency in using mathematical software,
 - know how to use appropriate technology to solve problems involving differential equations.
- 5. Assessment. Exams and assignments.** There will be **three semester exams, three assignments, three projects, and a cumulative final exam.** Assignments and projects turned in after their due date will receive an automatic reduction in grade. Any makeup exam must be taken **before** the next regularly scheduled exam. No assignment, project, or exam grade will be dropped.
- 6. Academic integrity:** Academic integrity is at the center of the educational experience at USciences. Students are therefore expected to uphold the highest standards of academic integrity and not engage in or tolerate academic dishonesty. Academic dishonesty includes, but is not limited to, fabrication, cheating or plagiarism. Any violation of academic integrity will be investigated and, where warranted, the student will receive appropriate sanctions through the University's Student Conduct Process. Please familiarize yourself with the current USciences Student Handbook. Adherence to the Student Conduct Policy and Academic Integrity Policy will help to ensure that your learning and living experiences are founded on integrity.
- 7. Americans with Disabilities Act (ADA) Compliance Statement:** USciences supports the educational endeavors of all students, including students with disabilities. ADA defines a disability as a mental or physical impairment that substantially limits one or more major life activities. If you believe that you have a disability that may impact your ability to fulfill your course or degree requirements, and you would like more information on applying for an accommodation under ADA, please contact the Administrator of Student Accommodations at 215-596-8758.