Math 331: Differential Equations **2017**
Elementary Differential Equations and Boundary Value Problems, Boyce & DiPrima 10th edition
Dr. Roland Minton, Trexler 270-C, 375-2358 **office hours** 10M, 3T, 3W, 10Th
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Course Objectives: *Continue to learn how to do mathematics!* Mathematics is a problem-solving discipline, and we all have room to improve. To develop as problem-solvers, we must focus on technique and not on memorization. In this course, we develop an understanding of the theory and elementary applications of differential equations. We will be able to take applications from first principles to models to solutions to interpretations. The theory will help us evaluate the limitations of our models. Our techniques will only apply to certain types of problems, so we supplement classical techniques with numerical work and approximate solutions from Mathematica.

Intended Learning Outcomes: At the end of the course, successful students will be able to

- Apply techniques of ordinary differential equations to solve problems
- Understand the role of differential equations in various applications
- Determine when different techniques, including approximate solutions, are appropriate
- Distinguish between linear and nonlinear equations, and find appropriate linear approximations

Attendance Policy: Regular attendance is expected. You are responsible for everything done in class, through your attendance and sharing class notes with classmates. If you miss a class, you must contact me and explain why. **If you have two unexplained absences, you will be dropped from the course.**

Equipment: We will use Mathematica in class, on homework assignments and on tests. You should have a (free) copy installed on a laptop and/or desktop.

Academic Integrity: The college policy is fully supported. Tests are closed notes, closed book unless noted. Electronic devices other than calculators are not allowed in test situations.

Homework: For the first half of the course, problems will be handed out in non-test weeks. These problems go beyond the basics of the course and are not test material. You should expect to spend time on these problems: start on them early, ask questions as needed, finish the mathematics early, and think about the best way to write the reports. Five of the six problems will count as 15% of your grade. Then, in groups of two, take one of the six problems and extend it: ask an interesting question not addressed in the original problem, answer it, and write up the solution in a nice report.

Study Problems: In each section, a group of problems will be recommended. You should attempt every problem as that section is being discussed, and ask questions in or out of class about problems that you do not understand. Study problems are the basis for tests. If you understand the study problems, you should have little trouble with the test questions.

Co-Curricular: During the course of the semester, you must attend at least three approved co-curricular events offered by the MCSP department. For each, write a two-paragraph reflection paper, giving a brief summary of the talk and expanding on some aspect of particular interest to you. Reports are due within a week of the talk.

Mastery-based Testing: test questions will be graded on a mastery/no mastery basis. Topics for mastery are listed on the next page. You will have multiple chances to demonstrate mastery of a topic. Once you do so, you will not be further tested on that topic. So, if you do not achieve mastery of a topic on one test, new problems on that topic will be given on subsequent tests. My judgment of mastery will be based on you demonstrating that you fully understand the question; your arithmetic and algebra do not have to be perfect, but there should be no flaws in your approach to the problem. While this style of grading has the downside of no partial credit, the upsides include the ability to completely make up for early deficiencies. You always have the possibility of demonstrating mastery on 100% of the topics for the semester. The point is not to allow you to delay learning topics to the end of the course, but to encourage you to fully understand the early topics so that later topics can make sense.

I expect you to spend at least 12 hours of work each week inside and outside of class.

Tests: There will be three tests and a final exam. All tests are mastery-based on the topics on the next page. Test dates are Th 2/9, T 3/21 and T 4/18. The exam is Friday, April 28, 8:30-11:30.

Make-ups: In case of sickness or scheduling conflicts, get in touch with me ASAP.

Grading: The test and exam scores count 75%. The best five of six homework grades, along with class participation and co-curricular reports, count 15%. The final project counts 10%. Grades may be curved up based on extenuating circumstances.
A: 93-100 A-: 90-92 B+: 87-89 B : 83-86 B-: 80-82 C+: 77-79 C: 73-76 C-: 70-72
D+: 67-69 D: 63-67 D-: 60-62 F: 59 and below

MASTERY TOPICS

1. Solve 1st order linear and separable equations.

2. Solve 1st order modeling problems.

3. Solve population modeling problems.

4. Solve exact equations.

5. Determine intervals in which unique solutions exist.

6. Approximate solutions numerically.

7. Solve linear systems of equations.

8. Solve linear systems with complex and repeated roots.

9. Draw phase plane portraits of solutions.

10. Determine the stability of nonlinear systems.

11. Analyze population models with two species.

12. Solve 2nd order constant coefficient equations.

13. Solve 2nd order constant coefficient equations with complex and repeated roots.

14. Find the form of solutions of nonhomogeneous equations.

15. Solve mechanical system problems.

16. Solve nth order equations.

Grading scale:

16/16 = 100	**10/16 = 76**	**5/16 = 50**
15/16 = 96	**9/16 = 72**	**4/16 = 40**
14/16 = 92	**8/16 = 68**	**3/16 = 30**
13/16 = 88	**7/16 = 64**	**2/16 = 20**
12/16 = 84	**6/16 = 60**	**1/16 = 10**
11/16 = 80		