

# Math 331: Differential Equations

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**Office Hours** Monday 10:30 - 11:30 am, Tuesday 11:30 am - 1 pm, Wednesday 1:15 - 2:30 pm or by appointment.

**Course Description** This course will provide the student with an introduction to differential equations, with the focus being on real-world applications. Topics include: First order differential equations, population and other physical models, linear equations of higher order, systems of differential equations, and nonlinear systems and phenomena. The course will also use technology (in particular Mathematica) to help us model and visualize problems.

**Learning Outcomes** By the end of the course, successful students will be able to:

- Apply their knowledge of differential equations to real-world phenomena.
- Compare the many different techniques available for solving ordinary differential equations most importantly determining which is appropriate for a given problem.
- Utilize technology to both find and visualize solutions to differential equation problems.
- Successfully employ techniques to analyze solutions of first and second order linear differential equations, systems of equations, and almost linear systems.
- Draw conclusions about the solutions to a variety of differential equations, without finding the solutions.
- Understand the role of modeling with differential equations in problem solving.

## Course Materials

Textbook: *Elementary Differential Equations and Boundary Value Problems*. Boyce and DiPrima, 11th Ed.  
Devices: Graphing calculator, access to a computer with Mathematica

## Important Dates

We will have six in-class tests and a final exam. Each test will focus on the material learned since the last test, but will (necessarily) contain previous material. The final will be comprehensive.

**If you have a conflict with one of these dates please email me ASAP.**

<b>Test 1</b>	<b>Thursday 9/16, in class</b>
<b>Test 2</b>	<b>Thursday 9/30, in class</b>
<b>Test 3</b>	<b>Thursday 10/14, in class</b>
<b>Test 4</b>	<b>Thursday 11/4, in class</b>
<b>Test 5</b>	<b>Thursday 11/18, in class</b>
<b>Test 6</b>	<b>Tuesday 12/7, in class</b>
<b>Final Exam</b>	<b>Monday 12/13, 2 - 5 pm</b>

The final course grade is determined in the following way:

<b>Homework &amp; Activity Responses</b>	<b>40%</b>
<b>Projects (3% each)</b>	<b>6%</b>
<b>Tests (7% each)</b>	<b>42%</b>
<b>Final Exam</b>	<b>12%</b>

A grade scale will be determined after final grades are computed, but will be no worse than the scale given below. Attendance and class participation will be considered when determining marginal grades.

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

**Homework** There will be a graded homework assigned each class and due by the beginning of the next class. **Late homework will not be accepted.** Submit your homework (as a PDF or Word file) using the links on Inquire. I am happy to help with these problems, but you **may not** work or consult on them with anyone else.

**Co-Curricular Activities** The MCSP department and Roanoke College offer many opportunities to engage with mathematical ideas outside of classes. Members of this class are encouraged to attend many of these activities, however attending at least three are mandatory. Examples include MCSP Conversation Series talks and student research showcases - if you're unsure if a given activity makes sense for this purpose, please email me to ask. Within one week of attendance you must submit a brief response to the activity. Your responses will count as part of your homework grade.

**Projects** We will have two projects, each on an application of differential equations. They will be extended problems written up as a paper, with emphasis placed not only on mathematical correctness but on the quality of the explanation.

**Daily Problems** After each section I will assign some problems from the book for practice. These will not be collected – the answers are in the back and they are your chance to make sure you understand the material and to get help if you realize you need it. Feel free to work with other students on these problems.

**Attendance Policy** Class attendance is expected. However, if you have a temperature of 100.4 or higher or other coronavirus symptoms, don't come to class. Call Health Services IMMEDIATELY. Do not come to class or go to any public area on campus. In order for your absence to be excused, you must give Health Services permission to notify me that you have consulted them about coronavirus symptoms. All absences caused by consultation with Health Services about coronavirus symptoms will be treated as if you'd discussed them with me beforehand. **If your absence is not coronavirus related and you have not discussed it with me beforehand, you will be unable to make up any work missed. Whatever the reason, if you have to miss class, you are responsible for learning all material covered that day.** If Health Services informs you that you should isolate and not attend class for multiple days or weeks, inform me so that we can make a plan to keep you current in the course.

**Mask Policy** Until the college changes its policy, face coverings/masks must be worn over the mouth and nose by all students and instructors in classrooms and hallways of academic buildings. **Students who come to class without a face mask that is being worn properly will be asked to leave and will be readmitted only after they are wearing one.**

**Expected Work Policy** This course expects you to spend at least 12 hours of work each week inside and outside of class.

**Electronic Devices** You can use **only** your graphing calculator during class. (This means no cell phones - please set them on silent and leave them in your bag.)

**Extra Resources** Subject tutoring is available through the Center for Teaching and Learning (in Fintel Library).

**Special Needs** If you have a disability that may require an accommodation in this course, please let me know and provide your documentation within the first 2 weeks of the semester. I must have your documentation at least 48 hours prior to any accommodation I make. (Check with the Center for Teaching and Learning for their scheduling guidelines.)

**Academic Integrity** I expect all of you to follow the Academic Integrity policies of Roanoke College. All graded work should be your own work! If you ever have questions about how these policies apply to our class please contact me. Any violations of these policies will automatically be turned over to the Academic Integrity Council.

**Pandemic Planning** If college policies change due to the pandemic, I will distribute an updated syllabus. I will email you our new plan and post details on Inquire. You should email me with any questions or challenges that arise.

**Course Schedule** The following schedule is approximate and subject to change except for the test dates. It should give you an idea of the timing of the topics covered and assignments.

Day	Date	Section / Topic
Th	S 2	1.1 / 1.2 / 1.3
Tu	S 7	2.1
Th	S 9	2.2 / 2.3
Tu	S 14	2.4 / 2.5
Th	S 16	<b>Test 1</b>
Tu	S 21	2.6
Th	S 23	3.1
Tu	S 28	3.2
Th	S 30	<b>Test 2</b>
Tu	O 5	3.3 / 3.4
Th	O 7	3.5 / 3.6
Tu	O 12	7.1 / 7.2
Th	O 14	<b>Test 3</b>
<b>Fall Break</b>		
Tu	O 26	7.3 / 7.4
Th	O 28	7.5 / 7.6
Tu	N 2	7.8
Th	N 4	<b>Test 4</b>
Tu	N 9	9.1 / 9.2
Th	N 11	9.3
Tu	N 16	9.3
Th	N 18	<b>Test 5</b>
Tu	N 23	9.4 / 9.5
<b>Thanksgiving Break</b>		
Tu	N 30	9.6
Th	D 2	9.6
Tu	D 7	<b>Test 6</b>
Th	D 9	Review
<b>M</b>	<b>D 13</b>	<b>Final Exam 2 - 5 pm</b>