

Math 306 C: Introduction to Differential Equations

Instructor(s)

Lecturer: Mark Sullivan

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Office hours: Mon and Wed, 10:00 AM ET to 11:00 AM ET

Teaching assistant: Mark Sullivan

Prerequisites

MTH 141 and MTH 142.

Textbook

The textbook for this course is free and open source. It can be found at the following address:

<https://tinyurl.com/306text>

Meeting times

January 31st, 2022 - May 13th, 2022

Lectures: found at <https://tinyurl.com/306clectures>

Recitations:

C1: 12:00 PM ET - 12:50 PM ET

C2: 1:00 PM ET - 1:50 PM ET

The recitations for this course will be held live over Zoom. The recitations will be recorded and made available for later viewing. For a link to the Zoom meeting, see UB Learns.

Course description

From the Mathematics Department: “Analytic solutions, qualitative behavior of solutions to differential equations. First-order and higher-order ordinary differential equations, including nonlinear equations. Covers analytic, geometric, and numerical perspectives as well as an interplay between methods and model problems. Discusses necessary matrix theory and explores differential equation models of phenomena from various disciplines. Uses a mathematical software system designed to aid in the numerical and qualitative study of solutions, and in the geometric interpretation of solutions.”

From me: This class has four topics:

1. First order ODEs (Chapter 1)
2. Higher order linear ODEs with constant coefficients (Chapters 2 and 6)
3. Power series methods for solving ODEs (Chapter 7)
4. Systems of ODEs (Chapter 3)

For each of these topics, we’ll have three goals:

- i. Finding general solutions
- ii. Finding solutions to initial value problems
- iii. Creating and studying diagrams of solutions

Assignments and grades

Homework will be assigned weekly throughout the course (with some exceptions). Each homework assignment will consist of at most five problems. You will have one week to complete each assignment. Homework will account for 30% of your final grade.

There will be **two midterm tests** throughout the semester. These tests will not be cumulative; no question that could have been asked on Test 1 will appear on Test 2. Each test will account for 20% of your final grade.

There will be a **cumulative final exam** for the course. See **Final exam information** for more details. It will account for 30% of your final grade.

To summarize:

Homework:	30%
Midterm test 01:	20%
Midterm test 02:	20%
Cumulative final:	30%

The following system will be used to assign letter grades:

Letter Grade	Course Average x
A	$93 \leq x \leq 100$
A-	$90 \leq x < 93$
B+	$87 \leq x < 90$
B	$83 \leq x < 87$
B-	$80 \leq x < 83$
C+	$77 \leq x < 80$
C	$73 \leq x < 77$
C-	$70 \leq x < 73$
D+	$67 \leq x < 70$
D	$60 \leq x < 67$
F	$0 \leq x < 60$

If I deem it necessary, I will make adjustments to the scale at the end of the course. At that time, I will assign grades that are better than or equal to the grades prescribed above. (Thus, any “curving” will be done at the end of the course. If you ask me about this during the semester, I will not be able to give you a complete answer.)

Final exam information

There will be a cumulative final exam for the course, scheduled for the following time:

8:00 AM ET to 11:00 AM ET on May 20, 2022

(If you have a conflict or some other legitimate reason for which you cannot attend the final exam at this time, you **must** inform me immediately.)

Expectations

Despite that this course is online, this is a serious university mathematics course, and it comes with the usual kinds of expectations. The following technologies are **essential**, not suggested:

1. Stable Internet access throughout the course.
2. A second device with a camera and Internet access, such as a tablet or smart-phone.

If you do not have access to these types of devices, then you must inform me immediately.

Additionally, if, during the course of the semester, you are unable to fulfill what would otherwise be expected of you (example: a power outage causes you to be unable to access or submit a test), then you **must** inform me immediately. For this reason, I have provided my cell phone number at the beginning of this syllabus. If your excuse is legitimate, and you inform me of the problem with appropriate haste, then I will be willing to discuss accommodations. If you fail to do so, then there won't be much that I'll be able to do to help.

Controlled enrollment

This is a Controlled Enrollment Course. If you need to repeat this course in the future (because you failed it, resigned from it etc. at the first attempt) you may be forced to do it in a UB summer or winter session. Registering to repeat this course in a Fall or Spring semester may be difficult or impossible. For more information see the Repeat Policy in the UB Undergraduate Catalog: <https://catalog.buffalo.edu/policies/repeat.html>.

Academic honesty

The University at Buffalo's policy on academic honesty can be found here:

<https://catalog.buffalo.edu/policies/integrity.html>

Specific to this class: no outside resources will be allowed on exams or quizzes. The only things you'll be able to use during an exam or quiz are paper, writing instruments, and your nervous system. Use of any other resource is prohibited.

To be frank, I really don't want to have to deal with academic dishonesty. If, during the course of the semester, I discover that you have not closely adhered to the university's policies, then you will get no sympathy from me. I will pursue the most severe punishment possible in that case. In short, **I assure you that it would be far better for you to fail the class honestly than to disobey the rules.**

Incomplete grades

If, at some point during the semester, you have a passing course grade, but are unable to finish the remaining coursework by the official end date of the course (due to exceptional circumstances), then you may be eligible to receive a grade of "I." The "I" grade is a temporary placeholder. It allows the student more time to complete the coursework than the semester would ordinarily allow. This requires the instructor to assess what assignments need to be made up, and to designate a deadline (less than 12 months) for the completion of these assignments. After this deadline, the "I" is replaced with an official grade for the course which considers all of the work the student has done from the beginning of the course up to the deadline. **In order for a grade of "I" to be assigned, the student must initiate a request for such an extension prior to the end of the semester.** Additional information about incompletes can be found here:

<https://catalog.buffalo.edu/policies/explanation.html>

Accessibility

Reasonable accommodations for equal access to this course because of disability should be requested through Accessibility Resources located at 60 Capen Hall, (716) 645-2608.

Advice

This class is hard. I have worked with many students in this class before, and not one of them has ever expressed to me that they found this course easier than Math 141 or Math 142. It would therefore be reasonable to expect that it will be harder than those classes. So, I have some pieces of advice for handling the class.

1. There is exactly one way to improve your skill in mathematics, and it's to practice doing the types of problems that you're studying. For some reason, we humans simply cannot learn how to do an activity well just by being told how to do it, or by watching someone else do it. To believe that you can become better at mathematics by watching someone else do it is equally absurd as believing that you can become a pianist by watching someone else play the piano.

2. Confidence comes from familiarity. As a psychological corollary to the previous point, the only way to get over any anxiety that you might feel (especially in preparation for a test) is to become so familiar with the material that nothing could possibly surprise you. Think of any task that you feel you could easily do. Surely you didn't always think you could do it. So, how did you overcome your self-doubt?

3. Budget your time. This is important in general, but especially so for exams. Divide the amount of time allotted for an exam by the number of problems on the exam. This gives you a guideline for how long to spend on each problem. (It would also be wise to budget for some additional time at the end of the exam, in order to deal with any unexpected difficulties.)

4. Check your e-mail daily. At times, it may be necessary for me to make an announcement through an e-mail. I promise you that if these e-mails were not important to you, then I would not send them.

5. Don't hesitate to ask me for help. Educating you is my job, and I happen to love my job. If there's ever anything I can do to help you learn, let me know. Additionally, if you have any suggestions for how I should run the course, I'd be open to those, as well.