Math 306 ML: Introduction to Differential Equations

Instructor(s)

Lecturer: Mark Sullivan
    E-mail: marksull@buffalo.edu
    Cell phone: (716) 458-5280
    Office hours: Tue, Wed, and Thu, 9:00 AM ET to 11:00 AM ET
Teaching assistant: Bud Rozwood
    Office hours: TBA
    E-mail: budrozwo@buffalo.edu

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:

$$\texttt{https://tinyurl.com/306text}$$

Meeting times

July 12th, 2021 - August 20th, 2021

Lectures: Tuesdays, Wednesdays, and Thursdays, 6:50 PM ET - 9:15 PM ET
Recitations: Tuesdays, Wednesdays, and Thursdays, 6:00 PM ET - 6:40 PM ET

The lectures and recitations for this course will be held live over Zoom. The lectures and recitations will be recorded and made available for later viewing.

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

Five homework assignments will be given throughout the course. Altogether, the homework will account for 30% of your final grade.

There will be **two exams** in the course, on **Thursday, July 29th** and **Thursday, August 19th**. These exams will not be cumulative; no question that could have been asked on Exam 1 will appear on Exam 2. Make-up exams will only be given in extreme circumstances, in which case, you'll have to provide documentation to prove that these circumstances stopped you from taking the test. Each exam will account for 30% of your final grade.

Six quizzes will be given on each Wednesday throughout the course. No make-up quizzes will be given; if you miss a quiz, then your score for that quiz will be a 0. Your lowest quiz score will not be counted. Altogether, the quizzes will account for 10% of your final grade.

To summarize:

Course Component	Percentage
Homework	30%
Quizzes	10%
Exam 1	30%
Exam 2	30%
TOTAL	100%

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	$0 \leq x < 60$

NOTE: Per department policy, no curves may be applied to the final course grade, and no extra credit may be granted.

Expectations

This is a serious university mathematics course, and it comes with the usual kinds of expectations, even if it is purely online. 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 smartphone.

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

Additionally, if, during the course, 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`.

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.

Academic honesty

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

`https://catalog.buffalo.edu/policies/integrity.html`

I really don't want to have to deal with this. 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.**

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 either of the previous courses. Of course, my job is to teach you, 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. This is pretty much the only way I can make announcements to the entire class. If you miss my e-mails, there won't be much that I can do for you.

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.