MA 214: Calculus IV

Section 008, Spring 2024

MWF 1:00pm-1:50pm in Whitehall Classroom Building (CB) 339

Contact Information:

Instructor: Sara Church

E-mail: sara.church@uky.edu

Office Hours:

Patterson Office Tower (POT) 706

MW 9:00am-10:30am

Mathskeller: F 9:00am-10:00am

My goal for this class is for us to work together to grow and learn, which will require patience and persistence. My job as your instructor is to guide you and answer your questions, so please don't hesitate to let me know how I can help you succeed in this class. Please ask or check the course website if you have any other questions. Let's have a great semester!

Zoom Link:

Any online meetings will be on Zoom at the following link:

`https://uky.zoom.us/j/83244733448?pwd=RURyOWFkNlZPaENCQ1JuNEY0WEsvZz09`

The password is MA214 and the link will be available on Canvas. Whenever you join the Zoom room, please email me as a "knock" on my virtual door.

Textbook & Software Requirements:

Our class has no required textbook. If you'd like an additional resource, I will be posting links on our Canvas page to some online resources I have used to create our course.

We will use Canvas daily to share course materials and announcements and to complete assignments, so it is important that you have access to our Canvas page and have email notifications turned on.

Our online homework system is called WeBWorK. It is free to use, and an account has already been set up for you. To access WeBWorK, you *must* use the link provided on our Canvas page. If you are inactive on WeBWorK for too long, you will be logged out and will need to log back in through Canvas.

You are allowed (and encouraged) to use a scientific calculator on Learning Check-ins. You should bring your own calculator. You may not pass a calculator back and forth with a classmate during Learning Check-ins, and you may not use your phone or tablet as a calculator.

Expectations:

I expect that you will be respectful toward yourself and others, regardless of your differences. At all times, constructive language should be used to describe the productive struggle of learning math. I expect that you will come to class ready to learn, ask questions, and engage in your own education.

You can expect me to encourage and respect you. **I commit to fostering such an environment for students of all genders, sexualities, disabilities, ages, socioeconomic statuses, ethnicities, races, and cultures. If at any point you feel unwelcome or uncomfortable in this class, please reach out to me immediately so I can change what I am doing or can intercede with a classmate on your behalf.** You can read UK's policy on inclusivity here:

`https://universitysenate.uky.edu/syllabus-statement-diversity-equity-and-inclusion-dei`

I will answer any questions you have to the best of my ability, and if I do not have an answer in the moment, I will search for an answer before our next meeting. **I welcome your concerns and criticism in an effort to make this class as effective as possible.**

Attendance & Participation:

Attendance is expected in MA 214 to help students have the best learning experience. In particular, your class participation will directly impact your preparedness for course assignments and subsequently impact your course grades. Therefore, I will be taking attendance regularly and it will count towards your grade in the course.

If you are unable to attend class, please email me directly in advance (if possible) so that we can determine how to best support you. **I value and respect other's privacy, so students do not need to explain or justify their absence to make up work. However, I do need proper documentation for an absence to be marked as "excused" for a learning check-in according to university policy:**

`https://universitysenate.uky.edu/standard-academic-policy-statements`

Please arrive on time and stay for the duration of class to make the most of the time you have to ask questions and try new problems. This also limits disruption for your fellow classmates. If you have special circumstances that require you to arrive late or leave early or are not feeling well during class, please let me know.

Course Objectives:
Calculus IV is about *Ordinary Differential Equations (ODEs)*. In this course, we will study the theory of ODEs, methods of solutions, and their applications. The main topics include:

(1) first-order ODEs

(2) constant-coefficient, second-order linear ODEs

(3) the Laplace transform and applications to ODEs

(4) power series methods for solving ODEs

(5) linear systems of ODEs

We will see applications to motivate the study of each of these topics. You will both discover the theory behind each of these topics and practice solving exercises related to them. From this course you will ideally gain stronger problem-solving skills, more mathematical resilience, and better technical communication.

Course Structure:
Your primary goal in this class should be to learn. This starts with class participation. Every day will have activities and practice problems which will allow you to get comfortable with the material first-hand. There will also be regular written homework and online homework through WeBWork. The goal of these is to allow you more time to explore the concepts outside of class. You are allowed to work with classmates on assignments as long as you continue to learn and express your own understanding. Then we will have a weekly learning check-in which is closed notes and timed to help you stay engaged in the material. At the end of the semester, there will be a final project. There will be more information about the project later in the term.

In this course, we will use a variant of a "specifications-based" or "points-free" assessment and grading system. Here are the key features you should be aware of:

1. **There are five elements to assessment and grading in this course:** Participation/Attendance, WeBWork, Written Homework, Learning Check-ins, and the Project.

2. **There are no points and no partial credit.** All problems/assignments will be given one of two grades: "Pass" or "Incomplete". The grade for each problem will be based on a combination of (a) correctness of the solution and (b) quality of communication in your writing.

3. **Your grade is determined by the amount of course material you have passed.** The requirements to achieve each letter grade are specified later in this section. By focusing on learning and mastery instead of accruing points, we can keep our attention focused on what we know and where we need to improve.

4. **The online homework allows unlimited attempts.** I expect you to make mistakes while you explore new concepts. The purpose of the online homework is for you to learn from your mistakes and to receive credit for that learning.

5. **You can revise some of your "Incomplete" problems:** My goal is for each of you to develop as mathematical thinkers, learners, and collaborators. To support this goal, you are allowed to revise and resubmit selected work during the semester from the Written Homework problems. The items eligible for revision each week will be announced in advance.

To earn a particular grade in the class, you need to complete **all of the requirements** in the column corresponding to that grade in the table below. If the entry lists "X%", then you need to receive a "Pass" grade on X% of those items to earn the corresponding column grade. Otherwise, is a count of problems passed.

	A	B	C	D	E
Participation (out of 42)	37	32	27	22	else
WeBWorK Homework (out of 100%)	90%	75%	60%	40%	else
Written Assignments (out of 30)	27	24	21	18	else
Learning Check-ins (out of 20)	18	16	14	12	else
Project (out of 100%)	90%	80%	70%	60%	else

Midterm grades will be determined based on a scale proportional to this one and how much has been completed and graded by that time. As this is a new grading scheme for many of you, I welcome any questions or concerns that you may have.

The five elements for grading in this course are as follows:

1. Participation/Attendance

- Attendance will be taken daily. I will take attendance through daily "exit tickets" which will be a way for you to tell me how you are feeling about material and life in general. There will be no mathematical content on exit tickets.

- You will get 1 point for every day you are in class.

- Students who miss class due to illness, family emergency, or other university excuses should request an excused absence from me via email before planned events or as soon as possible during/after unplanned events, even if a return date is uncertain.

2. WeBWork

- WeBWork problems will be assigned as homework on a weekly basis.
- All problems will have unlimited attempts until the assignment deadline.
- A **pass** will be given on a WeBWork problem if a correct solution is presented.
- Solutions will be posted after the assignment deadline.

3. Written Homework

- Homework problem sets will be assigned approximately weekly. They may be neatly hand-written or typed, with each problem clearly labeled in the assigned order. **You should not be turning in your first draft of solutions.**
- You are strongly encouraged to collaborate with your classmates in developing ideas regarding homework problems. Please do not let cooperation degenerate into one person solving the problem and other people copying their answers.
- **For each homework problem, indicate in your solution the people you shared ideas with and which resources you used.**
- You must write up your own answers to all problems. While it is important to celebrate mathematics as a social and cultural endeavor, it is also important that you work out the details for solutions on your own.
- A **pass** will be given on a homework problem if a correct solution is presented with all work shown and neatly organized.
- Each assignment must be submitted by 11:59pm on the due date. If you have an anticipated excused absence from class, you will still be expected to turn in your assignment on time.
- You may revise a limited number of homework problems (to be announced later in the semester).
- When you revise any homework problem you will be required to submit a paragraph reflection about what you learned while doing this problem. More details will be given on this later in the semester.

4. Learning Check-ins

- Learning Check-ins will take place regularly, about once a week with a small number of problems each. You will have 15-35 minutes to solve them and write up a clear solution.
- Research in cognitive and educational psychology[1] shows that frequent, low-stakes assessment leads to deeper learning than infrequent, high-stakes assessment.
- Learning Check-in dates will be listed on the course calendar in advance.
- **The purpose of these is to assess your ability to complete basic to moderate level problems without notes or other resources. In addition, it provides individual accountability in a heavily group-oriented class.**
- A **pass** will be given on a Learning Check-in problem if a correct process or procedure is presented with all work shown and neatly organized. An incorrect answer due to an arithmetic error may still receive a **pass**, if the work shown indicates an understanding of the major concepts of the problem. If the answer is correct, but it is not clear from the work shown how the student arrived at that solution, the problem will receive an **incomplete**.
- You may revise a limited number of Learning Check-ins per week (to be discussed later in the term). The revisions will be graded like your written assignments meaning a **pass** will be given on a revision if a correct solution is presented with all work shown.

5. Final Project

- Instead of a traditional final exam, there will be a final project for this class which covers material cumulatively.
- A portion of the project will be individual and the rest will be in assigned groups.
- Further details will be provided later in the semester as to the instructions and grading for this project. Students will be given at least 2 weeks advanced notice.

[1]Brown, Peter C., Roediger, Henry L., and McDaniel, Mark A. *Make It Stick: The Science of Successful Learning.* Belknap Press, 2014.
Ambrose, Susan A., Bridges, Michael W., DiPietro, Michele, Lovett, Marsha C., and Norman, Marie K. *How Learning Works: Seven Research-Based Principles for Smart Learning.* Jossey-Bass, 2010.

Personal Development Goals:
In addition to the math skills and methods that we will learn this semester, my goal is to help you build a number of life skills. As a priority, the following four will be built into homework, learning check-ins, and other assignments throughout the term:

- Collaboration - In life people rarely work alone, so it is important to learn the balance between working together and doing your part to contribute honestly. Therefore, there will be a component of the final project where you will have to decide how to accomplish all tasks as a team and submit one common summary of your work.

- Communication - Every class is built on communication between the students and their instructor. I want to address this skill more directly and work on your writing skills and articulation of your reasoning and logic. When others disagree with you, communication is your best tool to change their mind or at least justify your point. In this class, we will work on this skill each week within the written homework as you explain your reasoning for at least one of the assigned problems. The goal is to articulate how to solve the problem at a level that one may explain to a peer who does not know how to do it themself. We will also work on communication through the reflections where you will think on questions about why mathematical procedures work.

- Metacognition - Each person has their own unique way to learn, and it is ever-evolving. To help you discover more about how you learn best and improve your understanding of the material, we will complete reflection assignments with specific prompts to help guide you through the process.

- Self-Care - Your mental and physical health is imperative for living a long, happy life. It is also the best way to support your education. Therefore, I will regularly check in with you individually and as a class to make sure that you are aware of all the resources at your disposal and to see what I can do to contribute to a positive learning experience.

My goal is that, by the end of this class, we will have grown as people as well as mathematicians.

Communication:
Asking questions and communicating with your instructor are key to succeeding in any class. You can reach me best via email. I will answer emails between 8am and 5pm Monday-Friday, and outside of that window I will try to respond within 24 hours. I will also be emailing the class with updates and important announcements as necessary, so **be sure to check your UK email and Canvas announcements regularly.** During office hours, I will certainly be available and excited to answer your questions. If you or I are not on campus, we can still meet via Zoom. I recommend you talk to me in advance about meeting on Zoom to make sure that I am ready for you.

Accommodations:
If you have a documented disability that requires academic accommodations, please notify me as soon as possible. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (725 Rose Street Multidisciplinary Science Building Suite 407, 859-257-2754, `drc@uky.edu`) for coordination of campus disability services available to students with disabilities.

Integrity:
Everyone is expected to behave honestly and fairly. This is of the utmost importance, not only in this class but also in everyday life, because lying and cheating hurt more than just the individual. They also affect your community. Your behavior reflects on those around you and can disadvantage your peers. Therefore, misuse of resources, copying, or any other form of cheating will not be tolerated.

I reserve the right to alter this syllabus as necessary with proper notification. I am here for you, so please keep communicating with me and I will do the same. If we do, I genuinely believe this will be a positive and successful experience.