**Math 397, History and Applications of Calculus, Spring 2023**

| | |
|---|---|
| **Class Time:** | MWF 2:00-2:50 in 303 University Hall |
| **Instructor:** | Dr. Marcin Bownik |
| **E-Mail:** | `mbownik@uoregon.edu` |
| **Office:** | 323 Fenton |
| **Office Hours:** | M 10–11am, W 12pm–1pm, and F 11am–12pm, or by appointment |
| **Textbook:** | None. Instead, weekly required readings will be posted on canvas. |

1. **Course Description.** The aim of this course is to give students a deeper understanding of calculus, beyond what is covered in Math 251–253. Our focus is on how calculus is used to solve concrete application problems, rather than on the theoretical underpinnings of the subject. We will be interested in how problems arose historically, and in how calculus contributes to their solution.
2. **Course Goals.** The goal for the course is to give you experience at *reading* and *writing* mathematics, learning some more advanced calculus and some of its awesome historical applications along the way.

   What do I mean by *reading* mathematics? It is not at all easy to read a piece of mathematics written by someone else—it takes a long time to understand and digest someone else's explanations and can involve quite a lot of scratch work on your part as you try to piece the ideas together. In lower level classes, you seldom have to do any of that, but it is a very important skill as you move upwards. So in this course I will be assigning a piece of reading for you every week related to what we are doing that week. Please take these readings seriously and think hard about them! It is hard for me to evaluate or grade you on the basis of readings, but I am sure it will improve your mathematical maturity if you take it seriously. The readings will be useful when you are attempting homework, and give you additional background which you can draw on for the midterm project.

   What do I mean by *writing* mathematics? This is an art in itself that takes a lot of practice and experience. In this class, I am expecting you to learn and use the LaTeX system for typesetting mathematics. I strongly encourage that homework be turned in as .pdf files produced using LaTeX (it is okay to insert diagrams drawn by hand and scanned in for the first few weeks as that is another thing to learn). The midterm project and the final paper must be written using LaTeX. As well as the technical skill of typesetting math in LaTeX (which is a bit like computer programming), writing of mathematics involves a lot of decision making. You should assume the person reading your writing knows what you knew one week earlier, but really make an effort to explain what you mean.
3. **Learning Outcomes.** Students successfully completing this course will be able to:
   - Explain and analyze historical problems whose solutions involve calculus, and write mathematical narratives about them in LaTeX.
   - Use calculus to model a selection of application problems.
   - Use mathematical software, such as *Mathematica*, to perform numerical and graphical analyses of calculus-based situations.
4. **Homework.** Homework problems will be assigned every week and be due in on Wednesday on the material of the previous week. Homework needs to be submitted on Canvas. In

this course, homework assignments will focus on clear explanations of solutions. Students will learn LaTeX as part of the course to help their presentation be clearer.

Additionally, readings will be assigned throughout the term. Each student will be required to write a response, a summary, or a reflection on the reading as a part of weekly homework assignment.

5. **Midterm Project.** Your midterm project will be a writing assignment. You will take one of the topics covered in the course and explain some piece of it. The midterm project should be typeset in LaTeX and be around 3 pages.
6. **Final Paper.** In place of a final exam, students will write a final paper of about 8–12 pages of LaTeX document. The final paper is due at noon on Monday of the exam week. Your paper will analyze in detail a very specific modeling problem of your choice that uses calculus. It will review the necessary calculus background, analyze the model mathematically, discuss ways in which the model does or does not accurately reflect the real world, and provide computer experiments that readers can perform to explore various aspects of the model. The final paper should also include a complete bibliography.

   You should decide on a topic by Week 6 and then discuss with me either in person or by email. I recommend that you turn in a draft before the last week of classes in order to receive a feedback.
7. **Grading.** The grading distribution will be as follows:

| | |
|---|---|
| Reading Responses | 10% |
| Homework | 40% |
| Midterm Project | 20% |
| Final Paper | 30% |

8. **Attendance and classroom behavior:** Attendance, while strongly encouraged, is not required for this course. Students are expected to behave respectfully toward each other and toward the instructor during class time. This includes refraining from using cell phones during lectures.
9. **University policies:** University policies on academic misconduct, accessible education and accommodations, mandatory reporting obligations, and emergency policies can be found at: `https://provost.uoregon.edu/standard-university-syllabus-language`