Hayden Harker
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Office Hours: M 4-4:50pm, Tu 11-11:50am
Th 12-12:50pm, F 9-9:50am

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CRN 36079

Text: There is no textbook for this class, but I will provide readings throughout the term.

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. For example, we will begin the course in ancient Greece–studying how the Greeks computed volumes of pyramids via a strange technique called the "method of exhaustion". This was an early precursor to the infinitesimal methods of calculus, and we will examine how the two methods compare. Possible topics include those listed below. We will try to tackle a broad selection:

- Archimedess work on areas and volumes
- The math behind rainbows
- The Kepler problem of understanding planetary motion
- Mathematical theory of the rings of Saturn (after Laplace and Maxwell)
- The Great Inequality between Saturn and Jupiter (after Laplace)
- Alan Turings work on morphogenesis in biology
- Ramseys mathematical theory of national savings
- The mathematics of waves

Course 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 modern application problems.
- Use Mathematica (or other software) to perform numerical and graphical analyses of calculus-based situations.

Weekly homework problems, a midterm project and a final paper will provide students with opportunities to demonstrate the level of their abilities relative to the above learning outcomes.

Canvas: Readings and homework assignments will be posted on Canvas. Any other important information for the course such as the syllabus will also be available there.

Homework: Homework assignments will be due weekly on Wednesdays at the beginning of class. In this course, homework assignments will focus on clear explanations for solutions. Mathematical word processing is done in LaTeX, so students will learn this software package 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 short response to be handed in at the beginning of the class for which the reading is to be completed.

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 final product should be in LaTeX and be around three pages.

Final Paper: In place of a final exam, students will write a final paper of about 8–12 typed pages (single-spaced). This paper will be due at noon on Tuesday, June 12.

More details about the final paper will be discussed in week 3 or 4. Your paper will analyze in detail a very specific modeling problem 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.

Grade: Your grade will be computed using a weighted average of the components below.

Homework	40%
Midterm Project	25%
Final Paper	25%
Reading Responses	10%

Accommodations: *If you are a student with a documented accommodation(s) with the Accessible Education Center (AEC), please meet with me soon to discuss your needs. If you have not already requested a notification email from the AEC, you are also encouraged to contact the AEC in 155 Oregon Hall at 541-346-1155 or uoaec@uoregon.edu.*