

MATH 4990 – Capstone: Mathematical Models and Their Analysis Spring 2026

Class website:	https://tlakoba.w3.uvm.edu/AppliedUGMath
Textbook:	None. Use lecture notes posted on the class website.
Class Meets:	MWF: 2:20 – 3:10 pm (Waterman 456)
Instructor:	Dr. Taras I. Lakoba, Innovation Hall, Room E436 (802) 656-2610, tlakoba@uvm.edu , https://tlakoba.w3.uvm.edu
Student Drop-in Hours:	M: 11:20–12:20; W: 4:45–5:45; Th: 3:30 – 4:30; and by appointment. See https://tlakoba.w3.uvm.edu/teaching_26S.html for more information.
Important deadlines:	See UVM Academic Calendar at https://www.uvm.edu/registrar/uvm-academic-calendar-2025-2026

Prerequisites: MATH 2248 and either {MATH 2522 or MATH 2524} or familiarity with Linear Algebra through a Differential Equations course.

Class objectives: You will learn how the material from Calculus and Linear Algebra is used by scientists and engineers in their research related to applied mathematics. You will also practice giving presentations to the audience of your peers.

Computer work: You are encouraged (and expected) to use Mathematica for some of your calculations. Some assignments will require running Matlab codes; however, no prior experience with Matlab is expected.

Projects: There will be two presentation projects: a midterm and a final. The *midterm* presentation will be based on a paper related to Linear Algebra, whose exact topic will be posted on the course website by February 17. The date(s) of the midterm presentation will be announced at least two weeks in advance. This will be a class project in that the presentation material will be divided among the students, and each student will have to present only their part. However, each student will be required to coordinate their presentation with those of the other students. You will be graded on *both the content and the style* of your presentation. Please find more details on the **course website above**.

For your *final* project, you will select a topic, which will be a paper or book chapter/section from a list suggested by the instructor, and make a presentation about it to the class. (In cases where it is justified, I may allow two students to give a presentation on different parts of the same topic, or allow a student to present a topic of their own choice.) Your goal will be to convey the main results of the topic and, in particular, present its key calculations. The final presentation will be on Tuesday, May 5 in Waterman 456.

Practicing your presentations: An important objective of this course is to **teach** you to give presentations. Therefore, you will be **required to rehearse each of your two talks in front of me**. This way you can incorporate my feedback to improve your presentation. *If you fail to meet with me for a rehearsal, I will automatically lower your final grade by one level (e.g., from B to B-) per occasion. This will occur irrespective of the grade that you will receive for your presentation.*

Please see the general outline for both presentations on the back of this page.

Grading Policy: Homework: 50%, Midterm project: 23%, Final project: 27%.

Grading scheme: The threshold between **A–** and **A** will be set at X , where $92.00 < X \leq 93.00$ will be chosen based on my subjective criteria. (This is my equivalent of other instructors' curving class grades.) Once a value of X is selected, letter grades will be put in correspondence with the following brackets for the numeric grade:

D–	$[X - 30 - 3.33, X - 30);$	D	$[X - 30, X - 30 + 3.34);$	D+	$[X - 30 + 3.34, X - 20 - 3.33);$
C–	$[X - 20 - 3.33, X - 20);$	C	$[X - 20, X - 20 + 3.34);$	C+	$[X - 20 + 3.34, X - 10 - 3.33);$
B–	$[X - 10 - 3.33, X - 10);$	B	$[X - 10, X - 10 + 3.34);$	B+	$[X - 10 + 3.34, X - 3.33);$
A–	$[X - 3.33, X);$	A	$[X, X + 5.00);$	A+	$\geq X + 5.00.$

Note that these brackets are *strict*. This means that if your grade doesn't make the next bracket even by 0.01, that is it — it doesn't make it. This is what brackets, and thresholds in general, are for.

Please see back of this page for more information

Academic integrity: I expect you to read and understand **‘Policy on allowed and non-allowed collaboration on homework assignments’**, found on the course webpage immediately below the link to Homework assignments.

You are also expected to read and understand the UVM Code of Academic Integrity, found at <https://www.uvm.edu/policies/code-academic-integrity>. In particular, it prohibits students from: (a) using materials not explicitly approved by their instructor, and (b) presenting work substantially generated by AI as their own (see rubric ‘Standards,’ part 4).

Violations of academic integrity on any assignment will be dealt with as described in the link **‘Sanctions for academic integrity violations’**, found below this Syllabus on the course webpage.

See also the rubric ‘Prohibition of sharing course materials’ in the Generic Syllabus (posted next to this one).

Outline of preparation for the presentation projects

Your work on a presentation will involve the following steps:

1. Selection of your topic.
2. Obtaining my approval of your selection. For the midterm talk, this will simply mean that you’ll get the part of the paper that you have selected on the first-come-first-served basis. For the final talk, the process is slightly more complex and is described in detail in the section on Final project in the document Guidelines for your midterm and final presentations, posted on the course website.

Very important: You must obtain my approval (in writing) of your topic at least 10 days before the day of the first presentation by anyone in the class (the midterm presentations will be spread over several lecture periods, while the final presentations will all occur on the day of the final exam).

If you miss this deadline, the following will occur:

- For the *midterm*, I will assign you the part of the paper that has yet not been taken. You will not be able to dispute or alter my selection.
- For the *final*, you will not be allowed to give your final presentation, and **your score for it will be recorded as 0**.

3. Scheduling your rehearsal with me. My availability for rehearsals will be posted at least 2 weeks before the first scheduled presentation. Your responsibility will be to book a time that will work for you. **The penalty** for not scheduling, or scheduling but missing, your rehearsal, will be the reduction of your final numeric grade by 3.34% (i.e., by one grade bracket, e.g., from *B* to *B-*).

This will occur no matter how perfect your actual talk in class may be.

You may schedule your rehearsal before selecting your topic. However, the rule in item 2 above about obtaining my approval of your topic selection will still apply.

4. Preparation of your talk. Details are given in the respective sections of the document Guidelines for your midterm and final presentations. You are welcome to work with your classmates on the presentations, and you are strongly encouraged to seek help of the instructor as needed (see the aforementioned document for more detail).
5. Rehearsal. Details are given in the respective sections of the document Guidelines for your midterm and final presentations.
6. Modifying your talk according to the instructor’s suggestions that you have received during the rehearsal.
7. Delivering your talk on the scheduled day.