

MATH 311 Advanced Linear Algebra

2025 Spring

Basic Information

Instructor: Prof. Jen Paulhus jpaulhus@mtholyoke.edu

I do not check email between 8 PM and 8 AM on weekdays, and only infrequently on the weekends. I will make every effort to respond to emails within 24 hours.

Class Meetings: 3:15 - 4:30 PM TR 402 Clapp Laboratory

Class Webpage: jenpaulhus.com/teaching/MHC/ma311s25.html

My Office Hours: Mondays 4:00 - 5:00 PM, Tuesdays 10:30 - 11:30 AM,
Thursdays 9:30 - 10:30 AM, Fridays 11:30 AM -12:30 PM, *or by appointment*

My Office: 402A Clapp

Text: *Matrix Mathematics: A Second Course in Linear Algebra*, Garcia and Horn

Material Covered: The plan is to cover most of Chapters 1-11, and 14-17.

Learning Goals

Linear algebra is one of the foundational subjects in mathematics. It is used extensively across math disciplines, as well as in statistics, computer science, and data science. The goal of this class is for you to master core linear algebra content beyond a first course, particularly peeking behind the curtain to see how and why core ideas in linear algebra work the way they do. You will also gain expertise in using basic Python coding to help with computational aspects of linear algebra.

By the end of the semester, you should:

- Strengthen your writing and communication skills in mathematics to the point where your writing clearly articulates the key ideas to non-experts.
- Understand and be able to clearly articulate the motivation for, and crucial concepts of, advanced linear algebra.
- Be comfortable with using computers to do core linear algebra computations.
- Be prepared to apply the course topics in your own field of study.
- Develop skills to read and absorb new math content independently.

Progress towards these goals will be measured by the student's ability to:

- Solve increasingly difficult homework problems.
- Develop a personalized method for reading new mathematics independently.
- Write clear solutions to homework problems which may be understood by peers.
- Use Python to solve computational problems.
- Reflect critically upon your own learning.

Success in my Classes

Students come to this class with very different backgrounds, skills, and experiences. Usually the most successful students in my class have two things in common: they work hard, and they are able to self-reflect honestly and then make adjustments accordingly.

My job is to help you *all* learn advanced linear algebra. I do not think any less of you if you struggle with the material, or if you come ask me for help in office hours. In fact, I view struggling and discomfort with material as an essential part of learning! If you are frustrated or overwhelmed with the course, email me and we'll set up a time to talk.

Grading Policies

Homework Assignments

Problem sets are **35%** of your grade. Assignments will be posted on the class webpage. Each homework assignment is worth the same percent of your final grade, although point totals will vary from assignment to assignment. Homeworks are **due in the particular Google Drive folder I shared with you by 4PM most Fridays**. Any part of the assignment which is LaTeX'd may be turned in by 10 PM the same day. I will drop your lowest homework score. Early in the semester, some re-writes on homework solutions will be assigned, and for those early assignments, no late homework will be accepted. After the first few weeks, each student has the possibility to use up to 2 no-questions-asked late homeworks throughout the semester. This means each student can turn in 2 assignments up to 48 hours late as long as they let me know they will be doing so before the initial due date of the particular assignment. See the [grading rubric](#) for more information and suggestions for mathematical writing, as well as tips for solving math problems at this level.

Reading Reports

To get the most out of our class time, we want our brains to already be thinking about the material. As such, it will be a substantial benefit to you if you have done the assigned reading *before* each class. To demonstrate that you are keeping up with the readings, there will be a brief report for you to file about the reading material for the upcoming class. The report will take the form of a few questions in a Gradescope form, **due by 9 AM the day of class**. Links to the forms will be on Moodle. I will generally grade your responses for completion, not correctness, and cumulatively they will count for **25%** of your final grade. I expect students to fill in at least 85% of the reports before the relevant class. This means you can miss up to 4 reports without any impact to your grade.

Engagement

The only way to learn mathematics is to engage deeply with it, so **10%** of your grade will reflect how well you are engaging in the class. Your contributions to discussions in class, and your questions in my office hours impact this part of your grade. While I will not officially take attendance, if you miss a lot of classes or if you are perennially late for class, your engagement grade will suffer.

Class Summary

Each of you will be assigned one chapter of the book to write up careful summary notes for in LaTeX on a shared class Overleaf file. It is essential that the notes be a summary in your own words of most of the content. Outside of exact statements of definitions or statement of theorems, do not copy from the book. This assignment is 5% of your grade and you will be graded on the completeness and quality of your chapter summary.

Midterm Exam

There will be a midterm takehome exam after spring break worth 10%. The exam will be similar to homework except you will not be able to collaborate with other students.

Final Portfolio

At the end of the semester you will turn in a portfolio. I will provide more guidance later in the semester, but this will be an opportunity for you to highlight homework problems or coding you are particularly proud of, and reflect on what you have learned and how you have grown in the class. The portfolio is 15% of your final grade.

Seminar Series

There will be a number of opportunities to attend talks by students or visitors in the department. These talks give you a chance to hear new math and meet students and faculty in the department. If you attend at least 4 of the talks and email me a brief paragraph within 2 days of each talk telling me about something new you learned during the talk and something you have a question about from the talk, I will add 1/2 point to your final class grade.

Accommodations

Please contact me right away if you have an accommodation as I would like to meet with you and discuss your approved accommodations and our class. Disability Services is the office on campus that determines academic accommodations for students with disabilities. If you need official accommodations through Disability Services, you have a right to have these met and kept confidential. Please contact Disability Services, located in Mary Lyon Hall 3rd Floor, at 413-538-2634 or disability-services@mtholyoke.edu. If you are eligible for academic accommodations, you will be provided with an accommodation letter. For more information on who might be eligible for accommodations and the application process please see the [Disability Services website](#).

Class Policies

Workload

The amount of time students spend on this course outside of class varies depending on many factors, but about 8-10 hours a week beyond the classroom time is quite typical.

Academic Honesty

I expect all your work to abide by the MHC Honor Code, and if there is any work that does not, I will report it to the Academic Honor Board. For more detail on what constitutes an academic violation of the Honor Code, please see the College [Academic Rights and Responsibilities](#) webpage. More details on what types of shared work are allowed for this class are on [the rubric](#).

Some typical violations in this course fall under the following categories (taken from the webpage above).

- The unauthorized or unacknowledged use of material that is not a student's own.
- Cheating in any form in preparing assignments (including homework, essays or take-home exams), in completing in-class work (including quizzes or tests), or in taking a final examination.
- Unlawful or improper use of digital or online materials.

In my past experiences, students are more likely to contemplate violating the honor code when they are very stressed or overwhelmed in a class. If you find yourself thinking about violating the honor code on the homework, quizzes, or exam, come talk to me. If you are worried about your grade, or if you're frustrated about the material, come talk to me. If you just need a pep talk, come talk to me!

Python

Information about using Python and the class JupyterHub is on the Moodle page. I note at the top of the guide that the one thing I can guarantee with coding is that something will go wrong at some point! I am here to help and I do not assume you have prior coding experience.

Unsolicited Advice

- Take ownership of your education.
- Embrace the discomfort and struggle. There will also be moments of joy and excitement in the class!
- Spend time thinking about how you learn, and evaluating what is working and not working for you in your academic life.
- Understanding *why* we solve a problem in a certain way will result in a better grade than simply trying to mimic examples we have done previously.
- Think of math a bit like learning how to bowl. You can have someone explain to you how to throw the ball and how to put spin on it to make it hit the pins but chances are the first time you throw the bowling ball, you will throw a gutter ball. How do you improve at bowling? You practice. The same is true in math. The best way to learn math is to **practice, practice, practice**.
- **Read ahead in the material.**
- I can't say it enough, work together when you can.
- If you are struggling more than you think you should be, make an appointment to talk with me.