MATH 257
Linear Algebra with Computational Applications

Lectures and Discussions.

- Lectures: Asynchronous online lecture videos
- Lab Sections: synchronous online, Monday/Wednesday, (10am CDT for morning section(ONL) and 4pm for evening section(ONM))
- Office hours: Online, Tuesday/Thursday, (10am CDT for morning section(ONL) and 4pm for evening section(ONM))

Teaching Staff.

- Course Instructor: Tayyab Nawaz (math257Summer@netmath.illinois.edu)
- TA's: Wonwoo Kang, Anisha Adolphus Pinto

Learning Objectives.

- Familiarity with the core concepts of linear algebra
- Introduction to modern applications of linear algebra in a variety of fields
- Use of Python for linear algebra computations

Setup. The summer offering of Math 257 includes two hours per week of live, online computing labs held via Zoom, along with access to two hours of online zoom office hours for support with course material.

Grading. Here is an executive summary of the grading scheme for this course, followed by drop and exemption modifiers, as well as percent-to-letter grade conversions and exam curving. Details about each category are given later in this document.

Grading categories

(1) 2% Syllabus quiz and End of Course Survey
(2) 3% Quizzes
(3) 10% Lab attendance/completion (the two lowest scores will be dropped)
(4) 8% PrairieLearn (non-lab) homework (the two lowest scores will be dropped)
(5) 5% PrairieLearn lab homework (the two lowest scores will be dropped)
(6) 72% Three midterm exams (each 18% for total 54%) plus a Final Exam (18%)

Modifiers

- If your Final Exam is higher than one of your midterm scores, it will replace the lowest midterm score. A missed midterm exam will be counted as receiving a score of 0%.
- Any assignments for which you are "exempted" will be dropped. See below for the requirements for being "exempted."
- If you were "exempted" for exactly one midterm, we will use the average of [the other two midterms + Final] as the score for the exam you were "exempted" from.

- If you were "exempted" for more than one midterm (*very* unlikely), contact your professor for grading details.

Getting "exempted"

- To get excused from assignments in categories (3)-(6) see the "Absence Policy" document under *Course Information* on the course website.
- To be "exempted" from a midterm, you **need a letter from the Office of the Dean of Students** covering the *entire* exam window.
- There are no exemptions for the syllabus quiz or for the Final Exam.

Letter Grades

- 100.00 % - 98.00 % → A+
- 97.99 % - 93.00 % → A
- 92.99% - 90.00% → A-
- 89.99 % - 87.00 % → B+
- 86.99 % - 83.00 % → B
- 82.99 % - 80.00 % → B-
- 79.99 % - 77.00 % → C+
- 76.99 % - 73.00 % → C
- 72.99 % - 70.00 % → C-
- 69.99 % - 67.00 % → D+
- 66.99 % - 55.00 % → D
- 54.99 % - 0.00 % → F

Exam curves

We will curve each of the midterms and the Final Exam score such that the distribution of letter grades coincides with historic grade distributions for this course. No further curve will be applied at the end of the course.

In particular, there will be **no individual extra credit opportunities** after class instruction ends and closed assessments do not reopen. So make sure to work hard for every assessment!

Please check each week that your scores were entered correctly on Canvas. With so many students it can happen that your grade is entered incorrectly. If, after an assessment, you find an error in the grading, please email the relevant course staff *immediately*. It can always happen that we made a mistake, so we always encourage you to see us if you think that happened. *All rescoring requests must be made via email. Except for exams, rescoring requests will only be considered within a week of the assessment due date. For exams, rescoring requests will only be considered within a week of the posting of exam scores. Requests must be received before Reading Day.* So don't wait!

Introduction.

This is a first course in linear algebra. This covers basic definitions and algorithms of the subject needed in the higher level (engineering, science and economics) courses and more sophisticated mathematical techniques such as the Singular Value Decomposition.

In this course you learn the mathematical theory and how to implement it in Python. You will discover many of the striking modern applications of linear algebra, such as Google's PageRank algorithm, image and audio compression schemes such as JPEG and MP3, automatic face recognition and other data science and machine learning algorithms.

The course covers the same mathematical theory as MATH 415, but adds a focus on the computational and large data aspect of linear algebra through the lab sessions.

Technical equipment. Many aspects of this course will be conducted online. As such, each student will be assumed throughout the semester to have the necessary technical equipment to participate in course activities:

- a computer/laptop/tablet with a microphone,
- a stable internet access with sufficient bandwidth and data allowance for using Zoom
- in-person section students will need to have iClicker access (either via app or remote)

We do not grant accommodations due to technical issues accessing or completing assignments. Please contact the Student Assistance Center (helpdean@illinois.edu) immediately if you are missing any of required technology.

Other Linear Algebra courses. Be aware that course credit is not given for both MATH 257 and any of MATH 125, MATH 225, MATH 227, MATH 415, or ASRM 406. Any enrollment related questions should be sent to mathadvising@illinois.edu.

Three disclaimers.

- ⚠ This is not a course that only teaches you how to compute stuff. Computer will always be faster. Modern applications of linear algebra require a sophisticated understanding of theory and methods of linear algebra, and learning these is the purpose of this course. Some of it might look like *abstract* linear algebra. However, through the applications we cover in the discussions, you realize that this indeed is *applied* linear algebra.

- ⚠ If you already know some linear algebra, this course might look easy at the beginning. Don't be fooled into thinking it will stay like that. Even the material familiar to you will be covered in more depth here. Furthermore, the exams will require a deeper understanding of the concepts you already know something about. So *it is a good idea to take this course seriously from the beginning*.
- ⚠ If you find a typo or an error in any part of this course, please let us know by sending an email to the instructors. We appreciate your help, and are also happy to hear any further comments or suggestions. Thank you!

Course LMS site. The course site is as follows:

https://canvas.illinois.edu/courses/57070

All material will be available there or linked from there. Please note that if you have just registered for the course, you will automatically be given access within a few hours. *Only if you do not have access to the course site 48 hours after registering, then contact your instructor.*

Discussion section. Lab sections are held online via zoom on Mondays and Wednesdays at 10am (ONL section) and 4pm(ONM section).

https://courses.illinois.edu/schedule/2025/summer/MATH/257

During online lab sessions, you will use computational tools in Python to solve linear algebra problems in real world applications in science and engineering. You will be working together in small groups on a Python Jupyter notebook. Though the first session is a Python tutorial, **students are assumed to have prior experience in Python or be able to familiarize themselves quickly to Python.** Students without the requisite programming background have struggled to complete the course and should consult their advisor.
Attendance will be taken in the first 10 minutes. Note that it is not enough to just be present. You have to be actively working with your group on the project. If this is not the case, we will not consider you present.

Please note that due to the available drops in various assessment categories, we generally do not grant excused absences or extensions for short-term illnesses, but rather only in exceptional circumstances (e.g. university athletic participation or letter from Office of the Dean of Students).

Textbook. We will post extensive lecture notes for all lectures and practice problems online. For many students these notes are enough. If you still want to buy/download a book, here are some options (several of them free!) in no particular order:

- Philip N. Klein, *Coding the Matrix: Linear Algebra through Applications to Computer Science*, first edition, Newtonian Press
- Feryal Alayont, Steven Schlicker, *Linear Algebra and Applications: An Inquiry-Based Approach*, scholarworks.gvsu.edu/books/21/
- David Cherney, Tom Denton,Rohit Thomas, Andrew Waldron, *Linear Algebra*, www.math.ucdavis.edu/∼linear/
- Stephen Boyd and Lieven Vandenberghe, *Introduction to Applied Linear Algebra - Vectors, Matrices, and Least Squares*, https://web.stanford.edu/ boyd/vmls/

📖 Gilbert Strang, *Linear Algebra and its Applications*, fourth edition, Cengage.

You are not required to buy any of these textbooks. Please note the coverage and order of topics for these resources may differ from our course.

Slides and Videos. Lecture notes (slides) and module videos are available at the Canvas page of this course. An interactive version of the slides with fill-in boxes is also available. If you would like to use this feature, print out the fill-in slides and fill them out on your own or while watching the videos. Video errata may be found at the video link on the course site under the appropriate week's tab.

Be sure to spend some time thinking over the material in the module before attempting the quiz. Since these are conceptual questions, precision is important so read the lecture notes and the questions carefully.

There are many other great (free) videos about linear algebra. Here are some we recommend as an addition (not a substitute) for the lecture videos.

- 📹 *Essence of Linear Algebra* by 3Blue1Brown, on Youtube, highly recommended
- 📹 MIT lectures by Gilbert Strang, MIT Open Courseware
- 📹 *Coding the Matrix* videos by Philip Klein, on Youtube

Online homework. Each week there are few homeworks (lab and non-lab) both delivered through PrairieLearn. Both sets of homeworks are open-notes and you may collaborate with other students:
This course is listed in PrairieLearn as MATH 257 - Summer 2025 and can be accessed via https://us.prairielearn.com/pl/course_instance/182477

Netiquette. Since this course has a substantial online component, please be respectful of your fellow classmates and teaching staff in all online communications. Fostering a helpful learning environment requires everyone's cooperation. Remember that forum posts are visible to all students and staff in the course so please double-check your posts before submitting them.

PrairieLearn. We will use PrairieLearn for homework. See the Quick links at the top of the course page.The PraireLearn homework will lean towards computations, while the quizzes will focus more on conceptual problems.

How points are given on PrairieLearn. PrairieLearn places emphasis on mastery. The idea is to keep doing questions until you master the underlying concept or method. Once you do, you should be able to answer these questions very quickly.

The way this works in PrairieLearn is that each question has a value, a point total, and a point maximum. If you answer a question correctly, two things happen:

- ▶ The point total increases by the value, until you reach the point maximum.
- ▶ The value increases.

If you answer a question incorrectly, one thing happens:

- ▶ The value goes back to what it was originally.

This system rewards repeated correct answers, which tend to demonstrate mastery. There is no penalty (other than resetting the value) for answering a question incorrectly, so don't be afraid to submit an answer. Similarly, don't be afraid to keep doing

a question after you reach the point maximum - your point total with never go down!

Credit. There is no need to "submit" your homework. The system will record whatever your score is at that time. However, you'll note the following line at the top of your screen:

Available credit: 110% until 11:59PM, Fri, 01/25

What this means is that if you reach 100% prior to 11:59PM on that Friday - i.e., complete the homework early - you will receive an extra 10% bonus. You will see this reflected in your score (the instant you reach 100%, it will jump to 110%).

If you click on the "?" just to the right of the line about available credit, you'll see all the dates associated with this homework. In particular, it says:

- you can receive 100% until 11:59PM, Tuesday, 01/28,
- you can receive 80% until 11:59PM, Tuesday, 02/04.

Note that your score will never go down. For example, if you achieve 90% by 11:59PM on Tuesday, 01/28, you won't be able to increase your score after that time, but you won't be penalized for not reaching 100% - your score will remain 90% forever. On the other hand, if you achieve only 70% by 11:59PM on Tuesday, 01/28, you will be able to increase your score after that time (to a maximum of 80%).

Lab Homework (at 110%) will be due on 11:59PM on the given deadline. Unlike the non-lab homework, the lab homework will only be offered at 110% and 80%.

Any updates to regular homework deadlines for either type will be announced on CampusWire or during Zoom class sessions.

Please note that your overall PrairieLearn score in either lab/non-lab homework categories is capped at 100%. So even if you score 110% on every assignment, you will only receive 100% overall. The bonus is designed to help off-set homeworks where you may not have received full credit.

Typos/Errors. If you believe there is a typo or an error in a question, or if you believe your answer was graded incorrectly, please take a screenshot and post to CampusWire. We have access to all of your submissions and can check to see what, if anything, went wrong.

CampusWire. All announcements will be posted on CampusWire at

https://campuswire.com/p/GC9CDCFD8

Please make sure you are signed up for CampusWire. The registration PIN is 5506. When posting on CampusWire, please use the subject line wisely and post in the appropriate category. For example, if you ask something about matrix multiplication in Lecture notes 5, write "Lecture notes 5 - Matrix multiplication" and not just "Question about matrices". In addition, please post to the entire class whenever this is appropriate. No question will ever be held against you.

Syllabus Quiz. Because of the online format for much of this course, familiarity with course policies will be essential. All students will be required to complete by **11:59PM Friday June 20th** a syllabus quiz in the PL. This quiz covers basic course policies. It is open-notes and unlimited attempts are allowed. *Please complete this assessment as early as possible.*

Exams. There will be three midterm exams and a final exam, all administered through PrairieTest (see below). The midterms are from 10-10:50AM for ONL section and 04:00 - 04:50pm for ONM section Central Time on the following days:

- **Midterm 1: Wednesday, 06/25/25**
- **Midterm 2: Wednesday, 07/09/25**
- **Midterm 3: Wednesday, 07/23/25**
- **Final: Friday, 08/08/25**

Requests to be exempted from a midterm exam ***require an absence letter from the Office of the Dean of Students*** *that explicitly states your absence over the entire relevant exam window.*
If you have accommodations identified by the Division of Rehabilitation-Education Services (DRES) for exams, please send an email to the course instructor with the necessary documentation.

Cheating. No books, notes, cheat sheets or electronic devices are allowed during the exams except a non-graphing scientific calculator. We take cheating very seriously! A more detailed description of the University policy on cheating and plagiarism may be found in the following link:

http://www.las.illinois.edu/students/integrity/