

**Math 257: Linear Algebra with Computational Applications (3 credits)****Course Description**

Introductory course incorporating linear algebra concepts with computational tools, with real world applications to science, engineering and data science. Topics include linear equations, matrix operations, vector spaces, linear transformations, eigenvalues, eigenvectors, inner products and norms, orthogonality, linear regression, equilibrium, linear dynamical systems and the singular value decomposition. Credit is not given for both MATH 257 and any of MATH 125, MATH 225, MATH 227, MATH 415 or ASRM 406.

- AP Calculus AB (score of 4 or 5) or AP Calculus BC (score of 3 or above; subscore of 4 or 5); AP Computer Science A (score of 4 or 5)
- MATH 220 or MATH 221; CS 101 or equivalent programming experience.

Course Content

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 similar mathematical theory as MATH 415 but adds a focus on the computational and large data aspect of linear algebra through the lab sessions.

Lectures, Labs, Discussions

This course uses the Moodle Learning Management System and the [PrairieLearn online system](#). You will need a stable internet connection, sufficient bandwidth and data allowance for using a webcam and microphone on Zoom.

Exams

This course has three 90-minute midterm tests and a 3-hour final exam. Exams are administered using PrairieTest. More information can be found here:

<https://us.prairietest.com/pt/docs/students/online>

Other Information

- This course is adapted from the UIUC Spring 2021 course taught by Professor Philipp Hieronymi.
- 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 three options:
 - Klein, P. N. (2015). *Coding the matrix: Linear Algebra through applications to computer science*. Newtonian Press.
 - Cherney, D., Denton, T., & Waldron, A. (2013). *Linear Algebra*. University of California. (<https://www.math.ucdavis.edu/~linear/>)
 - Strang, G. (2006). *Linear algebra and its applications*. Thomson, Brooks/Cole.