

THE DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 631: Linear Algebra

Fall 2025 Course Syllabus

NJIT Academic Integrity Code: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: NJIT Academic Integrity Code.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

COURSE INFORMATION

Course Description: A graduate-level treatment of linear algebra with emphasis on mathematical rigor and depth of understanding. Topics include linear spaces, duality, matrices, determinants, spectral theory, inner product spaces, and matrix decomposition.

We will also discuss some applications of linear algebra, such as in numerical linear algebra, quantum materials, and continuum mechanics.

Number of Credits: 3

Prerequisites: MATH 222 and MATH 337, or departmental approval.

Course-Section and Instructors:

Course-Section	Instructor	Office
Math 631-001	Professor D. Massatt	Cullimore Hall 506

Office Hours: TBD. After hours are selected however, please feel free to reach out to me if you wish to meet outside office hours.

Required Textbook:

Linear Algebra and its Applications by Peter Lax (2nd ed.) Wiley
978-0471751564

- Online version of textbook: <https://matematicas.unex.es/~navarro/algebralineal/lax.pdf>

University-wide Withdrawal Date: The last day to withdraw with a W is **Monday, November 10, 2025**. It will be strictly enforced.

COURSE GOALS

Course Objectives

- To develop a deeper understanding of linear maps in a finite dimensional setting.
- To gain intuition for core concepts, including: eigenvalues and eigenvectors, spectral theorem, duality, rank, and determinants.
- To master the basics of linear algebra practice, including: solving a system of equations and applying matrix decompositions

Course Outcomes

- Students recognize when linear algebra concepts can be applied to a variety of mathematical and engineering problems.
- Students demonstrate the ability to apply numerical methods to solve linear algebra problems with accuracy, precision, and efficiency.
- Students demonstrate greater ability in making and understanding rigorous arguments.

POLICIES

DMS Course Policies: All DMS students must familiarize themselves with, and adhere to, the **Department of Mathematical Sciences Course Policies**, in addition to official **university-wide policies**. DMS takes these policies very seriously and enforces them strictly.

Grading Policy: The final grade in this course will be determined as follows:

Homework	25%
Midterm Exam	35%
Final Exam	40%

Your final letter grade will be based on the following tentative curve.

A	90 - 100	C+	76 - 79
B+	86 - 89	C	60 - 75
B	80 - 85	F	0 - 59

Attendance Policy: Attendance at all classes is **mandatory**. Please make sure you read and fully understand the **Math Department's Attendance Policy**.

Religious Observance: NJIT is committed to supporting students observing religious holidays. Students must notify their instructors in writing of any conflicts between course requirements and religious observances, ideally by the end of the second week of classes and no later than two weeks before the anticipated absence.

Email and Canvas: Regularly check your NJIT email account and the course information posted on Canvas for class assignments and announcements from your instructor.

Homework: Homework problem sets will be assigned regularly via Canvas.

- Collaboration with other students is encouraged, but write your own solutions independently.
- Proofs in assignments are expected to be written with mathematical rigor, and be clearly presented.
- No use of artificial intelligence services to answer homework questions.

Exams: As of now, all exams will be administered in person. Midterm exams will be held during a regular class meeting; the location and date of the final will be provided to you when they are set.

Midterm Exam	October 22, 2025
Final Exam Period	December 14 - 20, 2025

The final exam will cover all of the material taught in the entire course. Make sure you read and fully understand the [Math Department's Examination Policy](#).

Makeup Exam Policy: There will be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event an exam is not taken under rare circumstances where the student has a legitimate reason for missing the exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the Math Department Office/Instructor that the exam will be missed.

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times.

ADDITIONAL RESOURCES

Further Assistance: For further questions, students should contact their instructor. All instructors have regular office hours during the week. These office hours are listed on the Math Department's webpage for [Instructor Office Hours and Emails](#).

Accommodation of Disabilities: The Office of Accessibility Resources and Services (OARS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you need accommodation due to a disability, please contact the Office of Accessibility Resources and Services at oars@njit.edu, or visit Kupfrian Hall 201 to discuss your specific needs. A Letter of Accommodation Eligibility from the office authorizing student accommodations is required.

For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the Office of Accessibility Resources and Services (OARS) website at:

<https://www.njit.edu/accessibility/>

Important Dates (See: [Fall 2025 Academic Calendar, Registrar](#))

Date	Day	Event
September 1, 2025	Monday	Labor Day
September 2, 2025	Tuesday	First Day of Classes
September 8, 2025	Monday	Last Day to Add/Drop Classes

November 10, 2025	Monday	Last Day to Withdraw
November 25, 2025	Tuesday	Thursday Classes Meet
November 26, 2025	Wednesday	Friday Classes Meet
November 27 to November 30, 2025	Thursday to Sunday	Thanksgiving Recess - Closed
December 11, 2025	Thursday	Last Day of Classes
December 12, 2025	Friday	Reading Day 1
December 13, 2025	Saturday	Saturday Classes Meet
December 14 to December 20, 2025	Sunday to Saturday	Final Exam Period

Tentative Course Outline

Lecture	Topic
9/3	Chapter 1: Fundamentals
9/8, 9/10	Chapter 2: Duality
9/15, 9/17	Chapter 3: Linear Mappings
9/22, 9/24	Chapter 4: Matrices
9/29, 10/1	Chapter 5: Determinant and Trace
10/6, 10/8	Chapter 6: Spectral Theory
10/13, 10/15	Chapter 7: Euclidean Structure
10/20, 10/22	Chapter 7: Euclidean Structure Midterm Exam (10/22)
10/27, 10/29	Chapter 8: Spectral Theory of Self-Adjoint Mappings
11/3, 11/5	Chapter 8: Spectral Theory of Self-Adjoint Mappings
11/10, 11/12	Operator Theory Perspective
11/17, 11/19	Chapter 9: Calculus of Vector- and Matrix- Valued Functions
11/24	Parts of Chapter 10: Matrix Decompositions
12/1, 12/3	Parts of Chapter 10: Matrix Decompositions
12/8, 12/10	Applications and Review

*Updated by Professor D. Massatt - 2025
Department of Mathematical Sciences Course Syllabus, Fall 2025*