

## MATH 630: Linear Algebra and Applications

### *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:** (This course is not intended for students in the Master's in Applied Mathematics program or in the doctoral program in Mathematical Sciences.) Development of the concepts needed to study applications of linear algebra and matrix theory to science and engineering. Topics include linear systems of equations, matrix algebra, orthogonality, eigenvalues and eigenvectors, diagonalization, and matrix decompositions.

**Number of Credits:** 3

**Prerequisites:** MATH 211 or MATH 213, and MATH 222

**Course-Section and Instructors:**

Course-Section	Instructor
Math 630-101	Professor E. Ammicht

**Office Hours for All Math Instructors:** Fall 2025 Office Hours and Emails

**Recommended Textbook:**

Title	Linear Algebra and Learning from Data
Author	Gilbert Strang
Edition	First Edition (January 2019)
Publisher	Wellesley-Cambridge Press
ISBN #	978-06921963-8-0

**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:** Linear algebra concepts are key for understanding and creating machine learning algorithms, especially as applied to deep learning and neural networks. This course reviews linear algebra with applications to probability, statistics and optimization.

**Course Outcomes:** Students will gain a thorough understanding of the concepts and ideas of linear algebra, resulting in the ability to formulate problems and apply appropriate algorithms to their solution.

**Course Assessment:** There are homework assignments, quizzes and a midterm exam held in class during the semester. The final exam will consist of an in class presentation of a final project.

## 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 and Quizzes	40%
Midterm Exam	30%
Final Project/Final Exam	30%

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

A	86-100	C+	64-69
B+	80-85	C	50-63
B	70-79	F	0-49

**Attendance Policy:** Attendance at all classes will be recorded and 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.

**Homework:** Students are expected to *solve each problem from every section covered*. Study groups are strongly encouraged.

**Exams:** There will be regularly scheduled quizzes and one midterm exam during the semester and a presentation of a final project/final exam during the last class and the final exam week:

Midterm Exam	Oct 14, 2025
Final Exam Period	December 14-20, 2025

Exams and quizzes will test your knowledge of all the course material taught in the entire course. Make sure you read and fully understand the [Math Department's Examination Policy](#). This policy will be strictly enforced.

**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 an accommodation due to a disability, please contact the Office of Accessibility Resources and Services at [oars@njit.edu](mailto: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

## Course Outline

Lecture #	Date	Section #	Main Subject Topics
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1	Sep 2	1.1,1.2,1.3	<i>Vector and Matrix Operations, the Four Fundamental Subspaces</i>
2	Sep 9	1.4	<i>Gaussian Elimination, Gauss-Jordan Elimination, Inverses</i>
3	Sep 16	Class Notes	<i>Vector Spaces</i>
3	Sep 23	1.5	<i>Orthogonal Matrices, Givens Rotations, Householder Reflections</i>
4	Sep 30	Class Notes	<i>Normal Equations</i>
5	Oct 7	Class Notes	<i>QR Decomposition</i>
7	Oct 14		<i>MIDTERM EXAM</i>
7	Oct 14	Class Notes	<i>Determinants</i>
8	Oct 21	1.6, 1.7	<i>Eigenvalues, Eigenvectors, Positive Definite and Semidefinite Matrices</i>
9	Oct 28	1.8, 1.9	<i>Singular Value Decomposition, Eckart-Young Theorem</i>
10	Nov 4	1.10, 1.11	<i>Rayleigh Coefficients, Vector and Matrix Norms</i>
11	Nov 11	2.1, 2.2, 2.3	<i>Numerical Techniques</i>
12	Nov 18	2.4	<i>Randomized Matrix Multiplication and Applications</i>
13	Dec 2		<i>Final Project Presentations</i>
14	Dec 9		<i>Final Project Presentations</i>

*Updated by Professor E. Ammicht - 2025  
Department of Mathematical Sciences Course Syllabus, Fall 2025*