MATH 337: 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: Matrices, determinants, systems of linear equations, vector spaces, linear transformations, eigenvalues, eigenvectors, and related topics.

Number of Credits: 3

Prerequisites: MATH 112 with a grade of C or better or MATH 133 with a grade of C or better.

Course-Section and Instructors:

Course-Section	Instructor
Math 337-001	Professor J. Luke
Math 337-003	Professor M. Potocki-Dul
Math 337-005	Professor S. Alptekin
Math 337-007	Professor T. Nguyen
Math 337-009	Professor A. Sagiv
Math 337-011	Professor M. Potocki-Dul
Math 337-101	Professor S. Alptekin

Office Hours for All Math Instructors: Office Hours and Emails

Required Textbook:

Title	*A First Course in Linear Algebra*
Author	K. Kuttler and I. Farah
Edition	Version 2021 A
Publisher	Lyryx Learning Inc
Link	Available in Canvas

Linear Algebra and its Applications 5th edition by Lay

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:

The course seeks to develop

- understanding of the fundamental concepts of linear structure that support theoretical, applied and computational analysis primarily in finite dimensional vector spaces including linear combination, span, linear independence, basis and dimension, Euclidean structure, matrices and linear transformations, invertibility, rank, fundamental, and determinant,
- understanding of the fundamental algorithms of elementary linear algebra, Gaussian elimination and the Gram-Schmidt process, including proficiency in implementation both with pen and paper and by computer program,
- the ability to use linear theory, including spectral theory, to analyze problems common in applications including systems of linear equations, detection of linear dependence relations, LU factorization, diagonalization, orthogonalization, QR factorization, least squares solutions, and the singular value decomposition,
- basic computational proficiency, both with pen and paper and by computer program, with the use of the fundamental algorithms of elementary linear algebra for the solution of common problems including those listed above,
- mastery of the basic elements of two fundamental problems of linear algebra, solving linear systems and diagonalizing matrices, from both a theoretical and computational perspective.
- the capacity to apply linear algebra through treatment of applications such as balancing chemical equations, linear dynamics, and computer graphics.

Course Outcomes:

Students will be able to

- understand and utilize the basic concepts and methods of linear algebra to analyze basic applied problems,
- solve linear equations of equations and find eigenvalues and eigenvectors to enable diagonalization,
- implement basic solutions to problems of applied linear algebra both by hand and computer program (MATLAB),
- apply their understanding of linear algebra in appropriately formulated applications.

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:

On-line homework (5 - first three weeks)	5%
Spot check homework (25 - one per lesson)	5%
Common quizzes (15)	10%
MATLAB Assignments (~8)	10%
Midterm Exams (2)	40%
Final Cumulative Exam	30%

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

A	90 - 100	**C**	65 - 74
B+	85 - 89	**D**	50 - 64
B	80 - 84	**F**	0 - 49
C+	75 - 79		

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. This policy will be strictly enforced.

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.

Common Quizzes: Online quizzes, given on a roughly weekly basis, will focus on a collection of fifteen fundamental computations that are foundational for the course. The intention of the quizzes is to provide students an opportunity to begin mastery of these crucial computations on which much of the course depends. Instructors may supplement the common quizzes with quizzes specifically for their sections.

MATLAB Projects: Periodic MATLAB projects will cover the implementation and use of basic algorithms in linear algebra. The coding of the algorithms is not only a tool of application but also a pathway for understanding. Common exams will feature problems requiring proficiency with MATLAB implementation of basic algorithms.

Follow-up Problems: Homework assignments are provided as part of each lesson to assist students to develop their understanding and skills with linear algebra. These assignments are neither collected or graded. Students should develop and use judgment as to which exercises are needed for them to develop adequate understanding of the material. The standing advice, particularly at the beginning of the course, is that it is better to do too much than too little. Students are urged to seek assistance with problems and exercises with which they have struggled unsuccessfully.

On-line Homework: For each of the first five lessons, there is an online homework assignment.

Spot Check Homework: For each lesson there is a spot check homework assignment to be submitted on paper in the class following the meeting where the lesson is completed.

Exams: There will be two exams during the semester and a cumulative final exam during the final exam week:

Common Exam I	October 8, 2025
Common Exam II	November 19, 2025
Final Exam	December 14 - December 20, 2025

The final exam 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

Math Tutoring Center: Located in the Central King Building, Lower Level, Rm. G11 (See: Fall 2025 Hours)

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 are in need of accommodations due to a disability please If you need an accommodation due to a disability please contact the Office of Accessibility Resources and Services at oars@njit.edu. The office is located in Kupfrian Hall, Room 201. A Letter of Accommodation Eligibility from the Office of Accessibility Resources and Services office authorizing your accommodations will be 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
October 2, 2025	Thursday	Wellness Day
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 and Sunday	Thanksgiving Recess - Closed
December 11, 2025	Thursday	Last Day of Classes
December 12, 2025	Friday	Reading Day
December 13, 2025	Saturday	Saturday Classes Meet
December 14 to December 20, 2025	Sunday to Saturday	Final Exam Period

Course Outline

Lesson	Topic
1	***Column Vectors***
2	***Small Linear Systems & Clipping***
3	***Gauss-Jordan I: Preliminaries***
4	***Gauss-Jordan II: Implementation***
5	***Parametric Vector Form***
6	***Vectors and Matrices***
7	***Matrix Inverse***
8	***Matrix Factorization with Elementary Matrices***
9	***Orthogonal Matrices***

	Common Exam I (October 8)
10	*Projection Matrices*
11	*Determinants*
12	*The 2x2 Diagonalization Problem*
13	*Span, Independence and Basis*
14	*Operations on Subspaces*
15	*The Four Fundamental Subspaces*
16	*The 3x3 Diagonalization Problem*
17	*Orthogonal Projection, Least Squares and Linear Regression*
18	*The nxn Diagonalization Problem*
19	*Discrete Linear Dynamics I: Linear Difference Equations*
20	*Continuous Linear Dynamics II: Spring-Mass Systems & Continuous Rotation*
	Common Exam II (November 19)
21	*Gram-Schmidt & QR*
22	*Orthogonal Diagonalization*
23	*Singular Value Decomposition I*
24	*Singular Value Decomposition II*
25	*Singular Value Decomposition III*
	Final Exam