Summer 2023

MATH 337-041, 141, Summer 2023: Linear Algebra

Peter Ward

MATH 337: Linear Algebra
Summer 2023 Course Syllabus

NJIT Academic Integrity Code: All Students should be aware that the Department of Mathematical Sciences takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

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 337-041	Professor P. Ward
Math 337-141	Professor P. Ward

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

University-wide Withdrawal Date: Please see the Summer 2023 Academic Calendar for the last day to withdraw based on the summer session you are registered for.

COURSE GOALS

Course Objectives:

- Learn about matrices, determinants, applications to solving linear systems of equations, matrix factorization, eigenvalues and eigenvectors, Gram-Schmidt process.
- Cover relevant applications in economics, science and engineering to illustrate the utility of learning these topics.
- Use mathematical software, in problem solving, to allow the solution of more complex problems and provide visualization of the same.

Course Outcomes

- Prepare students for further study in theoretical courses such as differential and difference equations and least squares analyses.
- To enable students to use linear algebra for numerical solvability of many problems.
- Students are prepared for applying linear algebra to many practical applications in fields like economics, computer science, physics, engineering, archeology, demography, relativity, etc.

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:

Quizzes	30%
Midterm Exam	30%
Final Exam	40%

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

A	90 - 100	**C**	60 - 69
B+	85 - 89	**D**	50 - 59
B	75 - 84	**F**	0 - 49
C+	70 - 74		

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. Absences from class will inhibit your ability to fully participate in class discussions and problem solving sessions. Tardiness to class is very disruptive to the instructor and students and will not be tolerated. Students might be withdrawn from the class or receive an "F" because of absences.

Quiz Policy: A short quiz based on homework and lecture will be given weekly.

Exams: There will be one exam during the semester and a cumulative final exam:

Midterm Exam	June 21, 2023
Final Exam	July 17, 2023

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: Summer 2023 Hours)

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 contact Scott Janz, Associate Director of Disability Support Services at 973-596-5417 or via email at scott.p.janz@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: Summer 2023 Academic Calendar, Registrar)

Date	Day	Event
May 22, 2023	Monday	**Full, First, and Middle Summer** Session Begins
May 24, 2023	Wednesday	Last Day to Add/Drop for **First Summer** Session
May 26, 2023	Friday	Last Day to Add/Drop for **Middle Summer** Session
May 29, 2023	Monday	Last Day to Add/Drop for **Full Summer** Session
May 29, 2023	Monday	Memorial Day - University Closed/No Classes Scheduled
June 10, 2023	Saturday	Last Day to Withdraw from **First Summer** Session
June 16, 2023	Friday	Last Day to Withdraw from **Middle**

		Summer Session
June 16, 2023	Friday	Juneteenth - University Closed/No Classes Scheduled
June 26, 2023	Monday	Last Day of Classes for **First Summer** Session
June 30, 2023	Friday	Last Day to Withdraw from **Full Summer** Session
July 4, 2023	Tuesday	Independence Day - University Closed/No Classes Scheduled
July 5, 2023	Wednesday	**Second Summer** Session Begins
July 6, 2023	Thursday	Last Day to Add/Drop for **Second Summer** Session
July 17, 2023	Monday	Last Day of Classes for **Middle Summer** Session
July 20, 2023	Thursday	Last Day to Withdraw for **Second Summer** Session
August 8, 2023	Tuesday	Last Day of Classes for **Full and Second Summer** Session

Course Outline

Subject Topic	Topics	Textbook
1	Linear Systems in 2 and 3 Unknowns and Introduction to MATLAB	pp. 3-13
2	Gaussian Elimination	pp. 14-20
3	Parametric Vector Form	pp. 21-28
4	Uniqueness of RREF and the Associated Homogeneous System; Balancing Chemical Equations	pp. 25-35
5	Matrix Arithmetic & Algebra	pp. 53-70
6	Matrix Inverse	pp. 71-78, 87-90
7	Elementary Matrices, LU and LDU	pp. 79-86, 99-104
8	Determinants I	pp. 107-118
9	Determinants II	pp. 114-125
11	Concrete Euclidean Spaces	pp. 143-186
12	Spanning, Linear Independence and Basis	pp. 188-196, 197-207
13	Review for Midterm Exam	

13	Four Fundamental Subspaces	pp. 197-216
14	Orthogonal Bases and the Gram-Schmidt Process	pp. 229-240
15	Orthogonal Projection, Orthogonal Complement, Least-Squares Solutions and Linear Regression	pp. 240-252
16	Linear Transformation I	pp. 265-285
17	Eigenvalues and Eigenvectors	pp. 341-352
18	Diagonalization	pp. 355-364
19	Powers and Power Series	pp. 366-371, 386-390
20	Dynamical Systems	pp. 378-385
21	Orthogonal Diagonalization and the SVD	pp. 395-411
22	Linear Transformations II & III	pp. 287-322
23	Classical Applications of the Determinant	pp. 129-138
24	Review for Final Exam	

Updated by Professor P. Ward - 5/8/2023
Department of Mathematical Sciences Course Syllabus, Summer 2023