

MAT 104 E
Linear Algebra
Spring 2024

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Class Meetings: Mon 12:30-13:30
Wed 13:30-15:30
Room: MD227 - EG002

Textbook:

Steven J. Leon - Linear Algebra with Applications-Pearson (2014), 9th Ed.

Course Description

Covers systems of linear equations, algebra of matrices, linear transformations, determinants, vector spaces, linear transformations, eigenvalues and eigenvectors, diagonalization and orthogonality, special matrices and applications.

Course Outcomes:

Upon the completion of the course, students will be able to :

1. Find solutions of systems of linear equations by using Gauss-Jordan elimination method.
2. Identify and compute algebraic properties of matrices and determinants.
3. Demonstrate a thorough knowledge of vector spaces and subspaces.
4. Find basis and rank for column, row and null spaces of a given matrix.
5. Find eigenvalues, eigenvectors and eigenspace of a square matrix and use them for matrix diagonalization.
6. Define linear transformations and examine their properties.
7. Use Gram-Schmidt orthogonalization process to orthogonalize any given basis.

Course Work

Grading	%	Dates	Time
Quizes (4 in-class on paper, 3 in-class ww)	25 %	TBA	TBA
Exam I	25 %	TBA	TBA
Exam II (Webwork)	10 %	TBA	TBA
Final Exam	40 %	TBA	TBA

Explanation of Assessments

This course is integrated with WeBWork and Moodle systems. So, you must follow the instructions provided by your instructor to use the systems. There will be quizzes in addition to two midterm tests and a comprehensive final exam.

- There will be weekly quizzes. 4 quizzes will be in-class, on-paper. The topics and times on the schedule for them are approximate, students are supposed to follow in-class announcements. Highest 3 of in-class quizzes will be counted for the grading. There will be 3 more quizzes given in class on WeBWork. 1 highest of these will be counted for grading. No make-up quizzes will be given.
- Exam dates will be announced on campus information system. Refer to the syllabus to see the topics that will make up the material for each exam. With a valid written excuse and making immediate arrangements with the instructor, a makeup exam might be given.
- The final exam is comprehensive. The date and time of the final exam will be scheduled by the registrar's office.

Remarks and Rules

1. **Calculators are NOT allowed in all exams and quizzes.**
2. **Attendance:** It is the university policy that if a student is absent 30% of the class sessions (which, in our case, amount to **18 hours**), he/she will be withdrawn from the course with a grade of DZ.
3. **Late attendance:** Not only are you expected to be in class, but you are also expected to be there on time. **Three (3) late attendances will count as one absence.** Lateness is defined as: *showing up to class after the instructor has finished calling the class roster, and within the first 10 minutes of the lecture.* Showing up more than 10 minutes late to the lecture counts as an absence.
4. **Missing quizzes:** Quizzes cannot be made up.
5. **Academic integrity:** You are expected to submit your own work. Copying, cheating or plagiarism, if detected, will be reported to the university administration and further action might be taking from the university.
6. **Getting Help:** Students are encouraged to consult their instructor during his/her office hours or by appointment.
7. **Phones:** Using phones in class is considered as a distracting factor and a disrespect to the instructor. Therefore, students are expected to keep their phones off during class.
8. **Phones and smart devices during quizzes and exams:** All devices that can be used to violate the academic integrity policy are prohibited, and a violation of this policy can lead to severe actions against the student.
9. **Office Hour Rules:** No student is supposed to stay in for more than 10 minutes individually. This is not a 1-1 tutoring session. Your friends not showing up in an office hour does not mean that your instructor is reserved for you for a long period of time. Office hours are held for clarifying few points that you were stuck about the course material. It can not be a total review of one or more lectures. It can not be a complete solution desk for all your exercises either.

Course Syllabus and Weekly Schedule

WEEK Number	CHAPTER	SECTIONS
1	1. Matrices and Systems of Linear Equations 1.1, 1.2	<ul style="list-style-type: none"> • System of Linear Equations • The idea of Elimination • Matrices
2	1.3, 1.4	<ul style="list-style-type: none"> • Algebraic Properties of Matrix Operations • Echelon Form of a Matrix
3	1.5	<ul style="list-style-type: none"> • Gauss Elimination and Gauss-Jordan Methods • Elementary Matrices; Finding A^{-1} • LU Factorization • 1st Quiz
4	2. Determinants 2.1, 2.2	<ul style="list-style-type: none"> • Properties of Determinants • Cofactor Expansion
5	2.3	<ul style="list-style-type: none"> • Adjoint Matrix, A^{-1} (using determinants) • Cramer's Rule
6	3. Vector Spaces 3.1, 3.2	<ul style="list-style-type: none"> • Vector Spaces • Subspaces • 2nd Quiz
7	3.3	<ul style="list-style-type: none"> • Linear Independence • Span
8		<ul style="list-style-type: none"> • 1st Midterm
9	3.4, 3.5, 3.6	<ul style="list-style-type: none"> • Basis and Dimension • Change of Coordinates (Transition Matrix) • Fundamental Spaces (Null Space, Row/Column Spaces) • 3rd Quiz
10	4. Linear Transformations 4.1	<ul style="list-style-type: none"> • Definition and Examples • Kernel and Range of a Linear Transformation
11	4.2	<ul style="list-style-type: none"> • Representation Matrix of a Linear Transformation • 4th Quiz
12	6. Eigenvalues and Eigenvectors Diagonalization Exam II	<ul style="list-style-type: none"> • Eigenvalues and Eigenvectors • Diagonalizing a Matrix
13	5. Orthogonality 5.2	<ul style="list-style-type: none"> • Operations on Vectors: Dot Product, Norm, Projection • Orthogonality and Orthogonal Subspaces
14	5.5, 5.6	<ul style="list-style-type: none"> • Orthogonal Sets • Orthonormal Bases and Gram-Schmidt
Final Exam	COMPREHENSIVE	

Math 104E Suggested Problems from the book

Section	Exercises
1.1	1,2,3,4,5,6
1.2	1,2,3,4,5,6,8,9,10
1.3	1,2,3,4,5,6,7,8,13
1.5	1,2,3,4,5,6,7,8,9,10,11,12
2.1	1,2,3,4,5,6
2.2	1,2,3,4,7,9
2.3	1,2,3,4,5
3.1	4,10,11,12,13
3.2	1,2,3,4,5,11,12,13,18,19
3.3	1,2,4,5,6,7,8, (14,15)
3.4	1,2,3,4,5,6,7,8,11,12,14
3.5	1,2,3,4,5,6,7,8,9,10
3.6	1,2
4.1	5,6,9,17,18,19
4.2	1,2,3,4,6
5.1	1,2,3
5.2	1,2-a,3-b,4,
5.5	1,2-a,3,
5.6	1,3,5-a,7,8
6.1	1,2
6.3	1,2,3