640:250:15 Introduction to Linear Algebra

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Office Hours: **M 1-2 pm W 4-5 pm or by appointment**

Textbook: Spence, Insel & Friedberg *Elementary Linear Algebra: A Matrix Approach, 2nd Edition*, ISBN # 978-0-13-187141-0, Prentice-Hall, Upper Saddle River, NJ 07458

Prerequisite: CALC2 or 01:640:136 or 138

Course description Vectors in n-space, systems of linear equations, Gaussian elimination, span and linear independence of a set of vectors, matrix algebra, determinants, subspaces of n-space, basis and dimension, eigenvalues and eigenvectors, diagonalization of a matrix, geometry of vectors, projections, orthogonal sets of vectors, symmetric matrices, and applications.

Attendance: Attendance is expected for this course. Please inform me ahead of time, preferably by emails, if you are going to be late or absent in class for a legitimate reason, and also self-report online per university policy. Please turn off your cellphone or keep it in silent mode during the lectures.

Homework and quizzes: Problem-solving is an important part in the study of mathematics, so please finish and hand in homework in time, and make sure that you fully understand the solution of each problem! The homework for each week will be posted online each Thursday, collected on the next Thursday and returned in one week. Sketch of solutions will be posted online after the homework for each week is collected. Only selected problems will be graded. The lowest 2 homework grades will be dropped.

There will be 5 quizzes throughout the semester and the lowest 1 quiz grade will be dropped. The date of the quizzes will not be announced in advance. The quizzes and the exams will be based on homework problems.

Exam dates: Midterms will be on Fridays. The final exam is on Dec. 19, 8-11 pm.

Grading: 10% Homework, 10% Quizzes, 20% Midterm 1, 20% Midterm 2, 40% Final.

Other policies: There will be no make-ups for quizzes and midterms and no late homework allowed. However, if there is a legitimate, documented reason that you miss a homework, quiz or midterm please contact me as soon as possible so I can adjust your grade components accordingly. Make-up for the final exam for is allowed.

Policy and procedures regarding disability are indicated at `http://ods.rutgers.edu/`. If you need special accommodation, please present the Letter of Accommodation as early in the semester as possible.

All students are expected to be familiar with and abide by the academic integrity policy (`http://academicintegrity.rutgers.edu/academic-integrity-at-rutgers`). Violations will be taken very seriously.

Class Schedule (Tentative)

Lecture	Reading	Topics
1	1.1, 1.2	Matrices, Vectors, and Linear Combinations
2	1.3	Systems of Linear Equations; Reduced Row Echelon Form
3	1.4	Gaussian Elimination; Rank and Nullity of a Matrix
4	1.6	Span of a Set of Vectors
5	1.7	Linear Dependence and Linear Independence
6	1.7, 2.1	Homogeneous Systems; Matrix Multiplication
7	2.1	Matrix Algebra
8	2.3	Invertibility and Elementary Matrices;
		Column Correspondence Property
	App. E	Uniqueness of Reduced Row Echelon Form
9	2.4	Inverse of a Matrix
	2.5	Partitioned Matrices and Block Multiplication
10	2.6	LU Decomposition of a Matrix
11	**Midterm Exam #1**	
12	3.1	Determinants; Cofactor Expansions
13	3.2	Properties of Determinants
14	4.1	Subspaces
15	4.2	Basis and Dimension
16	4.3	Column Space, Null Space and Row Space of a Matrix
17	5.1	Eigenvalues and Eigenvectors
18	5.2	Characteristic Polynomial
19	5.3	Diagonalization of a Matrix
20	5.5	Examples of Diagonalization
21	**Midterm Exam # 2**	
22	6.1	Geometry of Vectors; Projection onto a Line
23	6.2	Orthogonal Sets of Vectors;
		Gram-Schmidt Process; QR factorization
24	6.3	Orthogonal Projection; Orthogonal Complements
		Projection onto Column Space; Closest Vector Property
25	6.4	Least Squares Method; Normal Equations; Solving Inconsistent Systems
26	6.5, 6.6	Orthogonal Matrices; Diagonalization of Symmetric Matrices
27	6.6	Diagonalization of Quadratic Forms
		Spectral Decomposition for Symmetric Matrices
28		Catch up and review

Student-Wellness Services:

- **Just in Case Web App** `http://codu.co/cee05e` Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.
- **Counseling, ADAP & Psychiatric Services (CAPS)** (848) 932-7884 17 Senior Street, New Brunswick NJ 08901 `http://www.rhscaps.rutgers.edu/` CAPS is a university mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professionals within Rutgers Health Services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

- **Violence Prevention & Victim Assistance (VPVA)** (848) 932-1181 3 Bartlett Street, New Brunswick NJ 08901 `http://www.vpva.rutgers.edu/` The Office for Violence Prvention and Victim Assistance provides confidential crisis intervention, counceling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours call 848-932-1181.
- **Disability Services** (848) 445-6800 Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway NJ 08854 `https://ods.rutgers.edu/` Rutgers University welcomes students with disabilities into all of the university's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact th appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation (`https://ods.rutgers.edu/students/documentation-guidelines`). If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodation. To begin this process, please complete the Registration form on the ODS website at `https://ods.rutgers.edu/students/registration-form`.
- **Scarlet Listeners** (732) 247-5555 `http://www.scarletlisteners.com` Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.