Spring 2001

640:250 Linear Algebra, Section C3
General Information

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Office Hours: Hill Center 236, Tuesday 2 or by appointment

Webpage: http://www.math.rutgers.edu/courses/250/250C-s01/C3

Text: Gilbert Strang, *Introduction to Linear Algebra*, 2nd edition. ISBN # 0-9614088-5-5, Wellesley-Cambridge Press, 1998.

Computer/Calculator: This section requires computational labs, to be carried out with the MATLAB software package (version 5.3). MATLAB is installed on PC's in all the Rutgers public computer labs (in ARC, Loree, College Avenue, Livingston). Students in the School of Engineering can also use MATLAB in the DSV Lab (Eng B-125/127) on Sun Ultra 10 workstations. You will need to bring a floppy disk with you to do the Lab assignments.
If you want to install MATLAB on your personal computer, you can purchase the Student Edition (for Windows 95/98, Linux or Macintosh) directly from MathWorks, Inc. (www.mathworks.com). The Student Edition includes some documentation and tutorials.

Although MATLAB is the preferred computational environment in this course, and is **required** for the Lab assignments, any graphing calculator will do some matrix algebra. More powerful ones (such as the TI-85 or TI-86) also do row reduction (LU decomposition) and eigenvalues/eigenvectors. You may find a calculator useful for some homework problems, but it is not required. Calculators (and crib sheets) will NOT be allowed on exams.

Exams, Homework, and Grades: There will be two midterm exams and a final exam. There will be six MATLAB assignments, and short unannounced quizzes based on the assigned homework problems will be given in class. The weightings to determine course grade will be as follows:

Midterm Exam #1	20 points
Midterm Exam #2	20 points
Homework and Quizzes	8 points
MATLAB Lab Assignments	12 points
Final Exam	40 points
Total	100 points

There will also be two extra-credit optional Applied Linear Algebra projects (requiring some MATLAB), which can add up to to 3 points each to the above total.

Our Section's Webpage: Course materials for this section are at our section's own home page,

http://www.math.rutgers.edu/courses/250/250C-s01/C3

which says "Section C3" in large type at the top. From the Mathematics Department web page http://www.math.rutgers.edu, you can link to this page by clicking on Course Materials, then Math 250, then "Spring 2001 MATLAB Sections", and then Section C3.

General Course Webpage: Some previous course materials and links to relevant web sites (for example, to MATLAB tutorials) are posted at http://www.math.rutgers.edu/courses/250. Our assignments and material may differ somewhat from the material on this page. For the right stuff, be sure to get to the page that says "Section C3" at the top.

640:250 Linear Algebra, Section C3: Syllabus Spring 2001

Class date	Reading	Topics
1/16	1.1, 1.2, 2.1	Vectors, Lengths and Dot Products, Vectors and Linear equations
	MATLAB Lab #1 – Introduction to MATLAB	
1/18	2.2, 2.3	The Idea of Elimination, Elimination using Matrices
1/23	2.4, 2.5	Rules for Matrix Operations; Inverse Matrices
1/25	2.6	Elimination by $A = LU$ Factorization
	MATLAB Lab #2 – $A = LU$ Factorization	
1/30	2.7	Transposes and Permutations, $PA = LU$ Factorization
	Extra-Credit Project #1 – Graphs and Matrices	
2/1	3.1	Spaces of Vectors
2/6	3.2	Nullspace of A
2/8	3.3	Rank; Echelon Matrices and Row Reduced Form
2/13	3.4	Complete Solution to $Ax = b$
	MATLAB Lab #3 – Solving $A\mathbf{x} = \mathbf{b}$	
2/15	3.5	Independence, Basis, and Dimension
2/20	3.6	Dimensions of the Four Subspaces
2/22	**Midterm Exam #1** — regular class time and place	
2/27	4.1	Orthogonality of the Four Subspaces
3/1	4.2, 4.3	Projections; Least Squares Approximate Solution to $A\mathbf{x} = \mathbf{b}$
	MATLAB Lab #4 – Vector Spaces and Approximate Solutions to $A\mathbf{x} = \mathbf{b}$	
3/6	4.4	Orthogonal Bases, Gram-Schmidt Algorithm, $A = QR$ Factorization
3/8	5.1	Determinant Function and its Properties
3/20	5.2	Permutations and Cofactors
3/22	5.3	Cramer's Rule, Inverses
	MATLAB Lab #5 – QR Factorization, Determinants and Eigenvalues	
3/27	6.1, 10.1	Introduction to Eigenvalues and Eigenvectors; Review of complex numbers
3/29	6.2	Diagonalizing a Matrix
	Extra-Credit Project #2 – Graphs and Markov Processes	
4/3	6.3	Applications to Differential Equations
4/5	6.4	Eigenvalues and Eigenvectors of Symmetric Matrices
	MATLAB Lab #6 – Symmetric Matrices, Positive-Definite Matrices, SVD	
4/10	**Midterm Exam # 2** — regular class time and place	
4/12	6.5	Positive Definite Matrices
4/17	6.7	Singular Value Decomposition (SVD)
4/19	7.1, 7.2	Linear Transformations and their Matrices
4/24	7.3, 7.4	Change of Basis; Dual Basis; Geometric meaning of SVD; Solving $Ax = b$ by pseudo-inverse
4/26		Catch up and review
	FINAL EXAM — time and place to be announced	