NORTHEASTERN UNIVERSITY
Department of Mathematics

MATH 2331 **SYLLABUS** Fall Semester, 2009

Instructor: E. Gover **Phone:** (617) 373-5652 **Office:** 549 LA
E-mail: e.gover@neu.edu **Office Hours:** M,Th 12:00–1:15pm, W 3:00–4:00pm + by appointment
Key# 10821 **Classes:** M,W,Th 1:35–2:40pm **Room:** 433 RY

Course Description: MTH U371, *Linear Algebra*, introduces some of the basic concepts, algorithms, theory, and applications of linear algebra. It includes the following topics:

- Systems of linear equations, Gauss-Jordan elimination, vectors and matrices (Chapter 1)
- Linear transformations and their inverses, geometry of linear transformations (Chapter 2)
- Subspaces of $\mathbb{R}^n$, image and kernel, linear independence and bases, dimension (Chapter 3)
- Vector spaces and linear transformations (Chapter 4)
- Projections, orthogonal bases, Gram-Schmidt process, QR-factorization, orthogonal transformations and matrices, least squares approximations and data fitting, inner product spaces (Chapter 5)
- Determinants and their properties (Chapter 6)
- Computation of eigenvalues and eigenvectors (Chapter 7)
- Symmetric matrices, quadratic forms, singular value decomposition (Chapter 8)—*if time permits*

Text: *Linear Algebra with Applications* (4th ed.), O. Bretscher, Pearson Prentice Hall, 2009

Blackboard website: Sample tests, sample and in-class test solutions, supplementary notes, other course materials

Grading: Three full-period class tests and three shorter quizzes are planned. The average of the two best quizzes will count as a fourth test. The best three of the four test scores will count for 60% of the numerical grade. No make-ups will be given for missed tests. The final exam, required for all students, will count for 40% of the grade. The letter grade will be determined from the numerical grade (rounded to the nearest integer) by:
A 94-100; $A-$ 90-93; $B+$ 87-89; B 83-86; $B-$ 80-82; $C+$ 77-79; C 73-76; $C-$ 70-72; $D+$ 66-69; D 58-65; $D-$ 50-57; F 0-49; U 0-72.

Suggested Homework Problems:

Section		Problems
1.1	Linear systems and their geometry	1,7,10,15,21,29,31
1.2	Matrices, vectors, Gaussian elimination	2,4,5,7,18,20-22,29-31,34,35,41
1.3	Solutions of linear systems, matrices	1,5,10-15,21-30,34-36,47,55
2.3	Matrix products	3,5,11,12,13,16-25,27,29,47,65
2.4	Inverse of a linear transformation	1,2,3,5,6,8,10,17,19,35,37,39,41
2.1	Linear transformations, inverses	1,2,3,5,6,9,10,24-30,47
2.2	Geometry of linear transformations	1,4,6-9,17,19,21,23-26,49
3.1	Subspaces, image and kernel of a linear transformation	1,3,5,7,10,14,15,23,25,33,35,42,53
3.2	Subspaces, linear independence, bases	1,3,4,11-33(odd only),37,39,46,49,52
3.3	Dimension of a subspace	1,3,5,7,11,17,21,23,27,37,39,49,52,56
4.1	Abstract Vector Spaces	6-11,12-14,16,19,24,39,47,48,49
4.2	Linear transformations between vector spaces	1,2,4,7,75-78
5.1	Orthogonal projections, orthonormal bases	1,3,5,13,15,17,22,27,28,35
5.2	The Gram-Schmidt process, QR-factorization	5,7,9,13,19,21,27,33,35
5.3	Orthogonal transformations and matrices	5-8,13-18,27-29,31,32,40,41
5.4	Least squares and data fitting	17-25,31,32
5.5	Inner product spaces	1,2,3b,9
6.1	Determinants	1-11(odd only),17,27,31,43,44
6.2	Properties of determinants	1,6,31,32,37-42
7.1	Eigenvectors, iterated matrices	1-7,9,15-18,34,43
7.2	Finding eigenvalues	1-13(odd only),21,28
7.3	Finding eigenvectors	1-13(odd only),21,44
7.4	Diagonalization	1,3,5,17,31,33,41
8.1	Symmetric matrices	1,3,5,7,23
8.2	Quadratic forms	1,4,15,17
8.3	Singular value decomposition	1,2,4,7,11,12

Comments: The instructor reserves the right to make changes in the syllabus. It is the responsibility of each student to be aware of all assignments and any syllabus changes announced in class or on the Blackboard website. If there are unresolved concerns about the instructor or the course, contact the course coordinator, Prof. E. Gover, 549 Lake, x. 5652, e.gover@neu.edu.