Math 545 - Linear Algebra for Applied Mathematics - FALL 2010
TuTh 2:30 → 3:45 LGRT 206

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Course Web page: http://www.math.umass.edu/∼markman/ **Please check it often!**
Office hours: (starting September 14, tentative) Tuesday 4:00 → 5:00 pm, Thursday
5:00 → 6:30 pm, and by appointment.

Prerequisites: Math 233, Math 235, Math 300.
Text: The main text will be:
Linear Algebra. An introductory approach, by C. W. Curtis, Corrected reprint of the 1984
fourth edition. Undergraduate Texts in Mathematics. Springer-Verlag, New York, 1993.

Description: In spite of it name, this is simply a second course in linear algebra, intended
for undergraduates as well as graduate students (in such fields as mathematics, statistics,
physics, engineering, etc. . .) who need to use linear algebra. The aim is to get a deeper
knowledge of both concepts and techniques. Students in this course will need to write
proofs (hence the math 300 prerequisite).

Homework: Will be assigned weekly and will be due each Thursday, unless mentioned
otherwise. The homework will be graded by a special grader. Due to lack of funds, it will
not be possible to grade all the homework problems assigned. A few of the homework
problems will be corrected and graded every week. Nevertheless, for your own benefit,
you will be asked to hand in *all* the homework problems assigned. Your grade on each
homework assignment will be calculated as follows:

70% The grade on the corrected problems.

30% Credit for handing in *most* of the homework problems assigned. Partial credit will
be given.

Late homework will not be collected. Instead, your three lowest grades will be dropped.

First Midterm: Tuesday, October 19, during class period.

Second Midterm: Thursday, November 18, during class period.

Final: During the week beginning Monday, December 13 and ending on Saturday, December 18. The precise date is yet to be determined.
See back . . .

Grades:

Homework–20%

Two Midterms–50% (each 25%, the first midterm can only help, see below)

Final Exam –30%

The numerical course grade will be a number between 0 and 1000, which is the maximum of the following two:

A) $(2 \times$ homework$) + (2.5 \times$ midterm 1$) + (2.5 \times$ midterm 2$) + (3 \times$ final$)$,

B) $(2 \times$ homework$) + \frac{80}{55}[(2.5 \times$ midterm 2$) + (3 \times$ final$)]$.

Syllabus:

1. A brief review of basic linear algebra. (Corresponding to the first nine Chapters of Curtis, most of which will be assumed as prerequisite).

2. The theory of a single linear transformation.

   (a) Eigenvalues, eigenvectors, characteristic polynomial

   (b) Minimal polynomial

   (c) Invariant subspaces, direct sums

   (d) Primary decomposition

   (e) Diagonalizable operators

   (f) Triangular form, Cayley-Hamilton Theorem

   (g) Rational and Jordan canonical form

3. Orthogonal and Unitary transformations

   (a) The Gram-Schmidt process

   (b) The structure of orthogonal transformations

   (c) The Principal Axis Theorem

   (d) Unitary transformations and the Spectral Theorem

4. Further topics and applications (selection among the following):

   (a) Systems of first order linear differential equations

   (b) The QR-algorithm for eigenvalues

   (c) Least square solution of a linear system

   (d) Perron-Frobenius Theorem

   (e) Singular value decomposition

   (f) Other applications, depending of time constraints and class preference.