Math 200 - Linear Algebra
Fall Term 2014
Course Description

September 1, 2014

Instructor: John Schmitt
Office: Warner 311, **Tel:** Ext. 5952
E-mail: jschmitt@middlebury.edu
Office Hours: Tuesday 1:30pm–3pm, Wednesday 11am–12noon, Friday 1–2:30pm and by arrangement

Meeting Times:
Section B – MWF, 10:10–11:00am Warner 203

Textbook: David Lay's *Linear Algebra and its Applications, 4th edition*, Pearson Education, Inc., Boston, 2012.

Homework: Homework will be assigned on a daily basis. The content of this course is best learned by *practicing problems.* I **encourage you to work together**. However, the write-up of homework solutions *should be done on your own.* Homework will be collected three times a week, on Monday, Wednesday and Friday. Please see my *Thoughts on Homework.*

Quizzes: I reserve the right to give quizzes. If given, they will be short in length and cover recent homework problems. They will generally be announced beforehand.

Additional Resources

- Several copies of course text, as well as some study guides, are available at the circulation desk in the Davis Family Library for short-term checkout. (I have several copies of the 3rd edition that I'm willing to lend for the semester – there are some differences in the editions.)
- Text available in library: Howard Anton, Chris Rorres, *Elementary linear algebra: applications version, 8th edition,* Wiley, New York, 2000.
- Text available in library: Peter D. Lax, *Linear algebra*, Wiley, New York, 1997.

- Text available in library: Serge Lang, *Linear Algebra, 3rd edition*, Springer-Verlag, New York, 1987.
- Textbook website: http://www.laylinalgebra.com
- Course website available at: http://community.middlebury.edu/∼jschmitt/
- Professor Swenton's interactive linear algebra website: http//community.middlebury.edu/∼mathanimations/
- The software package Maple is available on many computers throughout campus. Version 18 is now available and should facilitate computations and drawing when appropriate. Other software packages may also be useful, including Mathematica and MATLAB.

Special Needs: If you require special arrangements for class or during tests/exams please talk to me as soon as possible to make such arrangements.

Grading Percentages:

Homework/Quizzes	10
Midterms	60 (30 each)
Final	30

The lowest two homework scores will be dropped from consideration.

Assignment of Grades:

The assignment of grades will follow the scheme below at minimum.

90 and above	A
80 - 89	B
70 - 79	C
60 -69	D
below 60	F

Plus and minus will be assigned at my discretion.

Midterm Exams: Midterm on Chapters 1 and 2: Thursday, October 9 at 7:30pm
Midterm on Chapters 3 and 4: Thursday, November 6 at 7:30pm. Midterms may include a "pledged problem" due on or around the exam date.

Final Examon Chapters 5, 6 and the article entitled *The 25 billion dollar eigenvector* on Tuesday, December 9, 9am–12noon.

Absences: Please see me as far in advance as possible for absences that will occur on the day of an exam. Any such absences, or unforeseen ones, must be documented in writing by the appropriate person.

Honor Code: The Honor Code will be observed throughout this class and for all examinations. If you have a question about how the Honor Code applies to this class please ask.

Course Webpage: Problem sets and syllabi and other relevant material will be posted on a course website, available by linking from my homepage:
http://community.middlebury.edu/∼jschmitt/.

Basic Etiquette: Please turn off all cell phones and other noise-making electronic devices. I anticipate you remaining seated in the room for the entire time period, though not without exception.

Goals of the course:

- gain an understanding of basic linear algebra techniques,
- gain the skills to perform computations involving vectors, matrices and systems of linear equations,
- gain an appreciation for applications of linear algebra to biology, economics, engineering, physics, computer science and more,
- gain a desire for further study within mathematics,
- improve one's ability to write a logical and coherent mathematical proof.

Linear Algebra - Course Content

1. Linear Equations in Linear Algebra
    - Systems of linear equations
    - Row reduction and echelon forms
    - Vectors and vector equations
    - The matrix equation $A\mathbf{x} = \mathbf{b}$
    - Linear independence
2. Matrix algebra
    - Matrix operations
    - Characterizations of invertible matrices
3. Determinants
    - Basic introduction and properties
4. Vector spaces
    - Vector spaces and subspaces
    - Null spaces, column spaces and linear transformations
    - Bases, dimension, rank, change of basis
5. Eigenvalues and eigenvectors
    - Eigenvalues and eigenvectors
    - The characteristic equation
    - Diagonalization
    - Eigenvectors and linear transformations
6. Orthogonality and Least Squares
    - Inner product, length and orthogonality
    - Orthogonal sets and projections
    - The Gram-Schmidt process
7. Symmetric Matrices (if time permits)
    - Diagonalization
    - Singular value decomposition

Table 1: Below is a "fairly" accurate schedule for the topics we will cover, and Exam dates. These may change if need be.

Week beg. Mon.	Monday	Tuesday	Wednesday	Thursday	Friday
September 8	1.1 Systems of Linear Equations		1.2 Row reduction and echelon forms		1.3 Vector equations
September 15	1.4 The matrix equation $A\mathbf{x} = \mathbf{b}$		1.5 Solutions sets of linear systems		1.6 Network flow
September 22	1.7 Linear independence		1.8 Linear transformations		1.9 Matrix of linear transformation
September 29	2.1 Matrix operations (and adjacency matrices)		2.2 Inverse of a matrix		2.3 Characterizations of invertible matrices
October 6	2.4 Partitioned matrices		Questions	EXAM through 2.3	2.5 Matrix factorizations
October 13	Fall	recess	3.1 Into. to determinants		3.2 Properties of determinants
October 20	4.1 Vector spaces and subspaces		4.2 Null spaces, column spaces, linear transformations		4.3 Linearly independent sets; bases
October 27	4.4 Coordinate systems		4.5 Dimension of a vector space		4.6 Rank
November 3	4.7 Change of basis		Questions	Exam on 2.4 to 4.7	5.1 Eigenvectors and eigenvalues
November 10	5.2 The characteristic equation		5.3 Diagonalization		5.4 Eigenvectors and linear transformations
November 17	6.1 Inner product, length, orthogonality		6.2 Orthogonal sets		6.3 Orthogonal projections
November 24	6.4 Gram-Schmidt process		Thanks-	giving	recess
December 5	6.5 Least Squares		25 billion dollar eigenvector		and again