Instructor: John Schmitt  
Office: Warner 311, Tel: Ext. 5952  
E-mail: jschmitt@middlebury.edu  
Office Hours: Monday 1:30pm-2:30pm, Tuesday 9am-11am, Friday 1:30pm-2:30pm or by arrangement

Meeting Times:  
Section A – MWF, 10:10 am - 11:00 am Warner 208  
Section B – MWF, 11:15 am - 12:05 pm Warner 208


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.

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

• 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 12 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:

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Homework/Quizzes</td>
<td>10</td>
</tr>
<tr>
<td>Midterms</td>
<td>60</td>
</tr>
<tr>
<td>Final</td>
<td>30</td>
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</table>

The lowest two homework scores will be dropped from consideration.

Assignment of Grades:

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

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>90 and above</td>
<td>A</td>
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<tr>
<td>80 - 89</td>
<td>B</td>
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<tr>
<td>70 - 79</td>
<td>C</td>
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<tr>
<td>60 -69</td>
<td>D</td>
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<tr>
<td>below 60</td>
<td>F</td>
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Plus and minus will be assigned at my discretion.

Midterm Exams: Midterm on Chapters 1 and 2: Thursday, October 9th at 7pm
Midterm on Chapters 3 and 4: Thursday, November 6th at 7pm. Included in the midterms will be a “pledged problem” due on or around the exam date.

Final Exam: Tuesday, December 16 9am-12pm in Hillcrest 103

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.

<table>
<thead>
<tr>
<th>Date</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
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<tbody>
<tr>
<td>September 8</td>
<td>1.1 Systems of Linear Equations</td>
<td>1.2 Row reduction and echelon forms</td>
<td>1.3 Vector equations</td>
<td>1.6 Network flow</td>
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<tr>
<td>September 15</td>
<td>1.4 The matrix equation $A\mathbf{x} = \mathbf{b}$</td>
<td>1.5 Solutions sets of linear systems</td>
<td>1.9 Matrix of linear transformation</td>
<td>2.3 Characterizations of invertible matrices</td>
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<tr>
<td>September 22</td>
<td>1.7 Linear independence</td>
<td>1.8 Linear transformations</td>
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<tr>
<td>September 29</td>
<td>2.1 Matrix operations (and adjacency matrices)</td>
<td>2.2 Inverse of a matrix</td>
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<tr>
<td>October 6</td>
<td>2.4 Partitioned matrices</td>
<td>Questions</td>
<td>EXAM through 2.3</td>
<td>2.5 Matrix factorizations</td>
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<tr>
<td>October 13</td>
<td>Fall</td>
<td>recess</td>
<td>3.1 Intro. to determinants</td>
<td>3.2 Properties of determinants</td>
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<tr>
<td>October 20</td>
<td>4.1 Vector spaces and subspaces</td>
<td>4.2 Null spaces, column spaces, linear transformations</td>
<td>4.3 Linearly independent sets; bases</td>
<td>5.1 Eigenvectors and eigenvalues</td>
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<tr>
<td>October 27</td>
<td>4.4 Coordinate systems</td>
<td>4.5 Dimension of a vector space</td>
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<tr>
<td>November 3</td>
<td>4.7 Change of basis</td>
<td>Questions</td>
<td>Exam on 2.4 to 4.7</td>
<td>5.4 Eigenvectors and linear transformations</td>
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<tr>
<td>November 10</td>
<td>5.2 The characteristic equation</td>
<td>5.3 Diagonalization</td>
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<tr>
<td>November 17</td>
<td>6.1 Inner product, length, orthogonality</td>
<td>6.2 Orthogonal sets</td>
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<td>November 24</td>
<td>6.4 Gram-Schmidt process</td>
<td>Thanks-giving</td>
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<tr>
<td>December 1</td>
<td>6.5 Least Squares</td>
<td>7.1 Diagonalization of symmetric matrices</td>
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<td></td>
<td>Questions</td>
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