# Applied Linear Algebra

**Math 227Q Section 2**
**Spring 2008**

**Instructor:** Oscar Levin, MSB 329, 486-1283, olevin@math.uconn.edu
**Office Hours:** Mon 10-11, Tue 1-2, Thu 11-12.
**Website:** http://www.math.uconn.edu/~olevin/math227s08/
**Textbook:** *Linear Algebra and its Applications*, by David C. Lay, 3rd edition.

Welcome to what promises to be a very exciting semester of Linear Algebra! I am sure you are all very eager to get started, but please take a moment to look over this syllabus. It contains information on a whole slew of important topics (mostly related to this course).

**Exams:** There will be two midterm exams, and a cumulative final. The midterm exams will take place in class on the following dates:

Exam 1: Friday, February 22
Exam 2: Friday, April 4th

**Homework:** Homework will be assigned for each class period, as listed on the course webpage. You should do all the homework assigned by the due date listed (usually the next class period) and be prepared to answer questions about the problems. Homework will not be collected. Instead, we will have...

**Quizzes:** A short (15-20 minute) quiz will be given every Wednesday at the start of class. The quizzes will cover material from the lectures, the textbook and the homework exercises from the previous week. This is how you can demonstrate that you have done and understand the homework.

**In-class Work:** From time to time I may assign in class work, to be done in groups. Each group member should turn in their own copy of the assignment. In addition, you are expected to participate in class by asking questions, giving answers, and laughing at my jokes.

**Grading:** Your final grade will be calculated as follows:

| | |
|---|---|
| Quizzes and Class Work: | 25% |
| Exam 1: | 20% |
| Exam 2: | 20% |
| Final Exam: | 35% |

**Makeup Policy:** In general, missed quizzes and exams may not be made up. Exceptions will be made only in *very* extreme cases. Please contact me well in advance whenever possible if you need me to consider such an exception.

**Calculator Policy:** You may use calculators in this course, even on quizzes and exams. However, don't be seduced by your calculators ability to do some of the computations taught in this course. You will still have to show all your work on quizzes and exams, so make sure you can do all the problems by hand.

**Classroom Policies:** Please be considerate of your fellow classmates and do not act in a disruptive manor. Turn off your cell phones and mp3 players before coming to class, arrive on time, and do not pack up your things before the end of class. If you need to leave the room for any reason (like using the restroom) please do so as quietly as possible.

**Academic Integrity:** Don't cheat! Any infraction on graded work will result in a 0 for that assignment, quiz, or exam, possibly an "F" for the course, and a letter sent to the Dean of Students. If you are not sure what counts as cheating, please refer to the Student Code. When in doubt, don't do it!

**Suggestions for a Successful Semester:**

- Think critically! Don't believe something just because I tell you that it's true. Always ask yourself if you have good reason to believe it.
- Read each section before I talk about it in class. Doing so will make it easier to take notes and help you identify the questions you should ask.
- Do all the assigned homework, and if you have time, some problems that were not.
- A terrific way to learn math is to work with other students in the class, and I encourage you to do so. However, if a friend shows you how to do a homework problem, it is a good idea to find a similar problem to try on your own. Remember, you won't have that friend come test time.
- Never eat eggs which have passed the expiration date.
- Bring your copy of the textbook to class. As time permits, we will discuss homework problems, so being able to look in the book will be helpful. Also, bring your graphing calculator. (TI83 recommended, but others work too). And paper and pencil.
- If you need help, come see me in my office during the hours listed above or make an appointment with me for some other time.
- Extra help is available at the Q-Center in the Library.
- If you need non-math related help, you could try Counseling and Mental Health Services (486-4705), Alcohol and Other Drugs Services (486-9431), and the Dean of Students Office (486-3426).
- Most importantly, if you don't understand something: ASK!

**Tentative Schedule:**

| Week | Sections | Topics |
|---|---|---|
| Week 1 (1/23, 1/25) | 1.1, 1.2 | Systems of Linear Equations, Row Reduction and Echelon Forms. |
| Week 2 (1/28 - 2/1) | 1.3, 1.4, 1.5 | Vector Equations, The Matrix Equation $Ax = b$, Solution Sets of Linear Systems. |
| Week 3 (2/4 - 2/8) | 1.7, 1.8, 1.9 | Linear Independence, Introduction to Linear Transformations, the Matrix of a Linear Transformation. |
| Week 4 (2/11 - 2/15) | 2.1, 2.2, 2.3 | Matrix Algebra: Operations, Inverses, Characterizations of Invertible Matrices. |
| Week 5 (2/18 - 2/22) | – | Review<br>Exam 1: Friday Feb. 22nd |
| Week 6 (2/25 - 2/29) | 3.1, 3.2, 3.3 | Determinants: Introduction, Properties, and Geometric Interpretations. |
| Week 7 (3/3 - 3/7) | 4.1, 4.2 | Vector Spaces: Subspaces, Null Spaces, Column Spaces, and Linear Transformations. |
| 3/9 - 3/14 | No Classes | Spring Break |
| Week 8 (3/17 - 3/21) | 4.3, 4.4 | Linearly Independent Sets, Bases, Coordinate Systems. |
| Week 9 (3/24 - 3/28) | 4.5, 4.6, 4.7 | Dimension and Rank of Vector Spaces, Change of Basis. |
| Week 10 (3/31 - 4/4) | – | Review<br>Exam 2: April 4th |
| Week 11 (4/7 - 4/11) | 5.1, 5.2, 5.3 | Eigenvalues and Eigenvectors, The Characteristic Equation, Diagonalization. |
| Week 12 (4/14 - 4/18) | 5.4, 6.1, 6.2 | Eigenvectors and Linear Transformations, Inner Product, Length and Orthogonality. |
| Week 13 (4/21 - 4/25) | 6.3, 6.4, 7.1 | Orthogonal Projections, The Gram-Schmidt Process Diagonalization of Symmetric Matrices |
| Week 14 (4/28 - 5/2) | – | Review |

**First homework assignments:**

| Section | Problems | Due Date | Date of Quiz |
|---|---|---|---|
| 1.1 | 2, 3, 8, 10, 13, 16, 18, 21, 23, 24 | 1/25 | 1/30 |
| 1.2 | 2, 10, 13, 14, 18, 19, 21, 22, 24, 29, 31 | 1/28 | 1/30 |
| 1.3 | 1, 3, 6, 7, 9, 12, 14, 17, 21, 22, 23, 24, 25 | 1/30 | 2/6 |

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## Home work assignments to be handed in

| Section | Problems | Due Date |
|---|---|---|
| **Chapter 1** | | |
| Page ** | | |
| Page ** | | |
| Page ** | | |

## Home work assignments to be worked out and discussed in class (not handed in)

| Section | Problems |
|---|---|
| **Chapter 1** | |
| Section 1.1 | 2,3,8,10,12,13,16,18,21,24,25 |
| Section 1.2 | 2,10,13,14,18,19,24,29,31 |
| Section 1.3 | 3,6,7,9,12,13,17,21,22,23,25 |
| Section 1.4 | 1,4,7,9,11,13,17,19,22,23,25,31 |
| Section 1.5 | 2,6,11,16,17,19,22,23,28,30 |
| Section 1.7 | 1,2,5,8,9,12,15,16,20,21,32,34,36,40 |
| Section 1.8 | 2,4,8,9,11,13,15,17,21,25,27,31,36 |
| Section 1.9 | 1,2,3,13,15,20,23,26,29,32,36 |
| **Chapter 2** | |
| Section 2.1 | 2, 5, 7, 10, 15, 18, 22, 27, 28 |
| Section 2.2 | 3, 6, 7, 11, 12, 13, 18, 23, 24, 29, 32, 37 |
| Section 2.3 | 1, 3, 5, 8, 11, 13, 15, 16, 22, 26, 35, 40 |
| **Chapter 3** | |
| Section 3.1 | 4, 8, 11, 13, 20, 21, 31, 32, 37, 39 |

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|---|---|
| Section 3.2 | 2, 3, 8, 10, 16, 17, 20, 26, 27, 32, 34, 40 |
| Section 3.3 | 4, 6, 13, 16, 18, 22, 23, 26, 29, 30 |
| **Chapter 4** | |
| Section 4.1 | 1, 3, 7, 8, 11, 13, 15, 17, 22, 23, 31, 32 |
| Section 4.2 | 3, 6, 11, 14, 17, 19, 21, 24, 25, 32, 33, 34, 36 |
| Section 4.3 | 3, 4, 8, 10, 14, 15, 21, 23, 24, 29, 30, 31, 33 |
| Section 4.4 | 2, 3, 5, 7, 10, 11, 13, 15, 17, 21, 23, 32 |
| Section 4.5 | 1, 4, 8, 11, 14, 17, 21, 23, 26, 28, 29, 31 |
| Section 4.6 | 3, 5, 7, 10, 13, 19, 24, 27, 28 |
| **Chapter 5** | |
| Section 5.1 | 2, 6, 7, 11, 13, 15, 19, 21, 23, 24, 25, 27, 31 |
| Section 5.2 | 2, 5, 9, 12, 15, 19, 20, 21, 25 |
| Section 5.3 | 1, 4, 5, 9, 11, 15, 17, 21, 24, 26, 31 |
| **Chapter 6** | |
| Section 6.1 | 3, 5, 10, 16, 18, 19, 23, 25, 27, 29 |
| Section 6.2 | 3, 6, 8, 9, 11, 14, 20, 21, 23, 26, 27, 28, 29 |
| Section 6.3 | 1, 6, 7, 9, 11, 13, 17, 21, 23, 24 |
| Section 6.4 | 1,5,7,9,11,22 |
| Section 6.5 | 1,3,5,12 |
| **Chapter 7** | |
| Section 7.1 | 7, 13, 17, 22, 23,30 |

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## Home work assignments to be handed in

| Section | Problems | Due Date |
|---|---|---|
| **Chapter 1** | | |
| Page 102 | 1abcdefg,5,7ab | |
| Page 102 | 9,14,16,21 | |
| Page 211 | 1(j,l,l,n,p), 5, 9, 11 | |

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| **Chapter 1** | |
| Section 1.1 | 2,3,8,10,12,13,16,18,21,24,25 |
| Section 1.2 | 2,10,13,14,18,19,24,29,31 |
| Section 1.3 | 3,6,7,9,12,13,17,21,22,23,25 |
| Section 1.4 | 1,4,7,9,11,13,17,19,22,23,25,31 |
| Section 1.5 | 2,6,11,16,17,19,22,23,28,30 |
| Section 1.7 | 1,2,5,8,9,12,15,16,20,21,32,34,36,40 |
| Section 1.8 | 2,4,8,9,11,13,15,17,21,25,27,31,36 |
| Section 1.9 | 1,2,3,13,15,20,23,26,29,32,36 |
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| Section 6.3 | 1, 6, 7, 9, 11, 13, 17, 21, 23, 24 |
| Section 6.4 | 1,5,7,9,11,22 |
| Section 6.5 | 1,3,5,12 |
| **Chapter 7** | |
| Section 7.1 | 7, 13, 17, 22, 23,30 |

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| **Chapter 1** | | |
| Page 102 | 1abcdefg,5,7ab | |
| Page 102 | 9,14,16,21 | |
| Page 211 | 1(j,l,l,n,p), 5, 9, 11 | |

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| Section 1.4 | 1,4,7,9,11,13,17,19,22,23,25,31 |
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| Section 5.3 | 1, 4, 5, 9, 11, 15, 17, 21, 24, 26, 31 |
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| Section 6.4 | 1,5,7,9,11,22 |
| Section 6.5 | 1,3,5,12 |
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