Math 21              Linear Algebra              Fall 2012

Updated 9/27/12

INSTRUCTOR

Instructor: Debra Lewis
Office: 4122 McHenry
Office hours: Tuesday 12:00-1:30, Friday 11:15-12:45, and by appointment
Phone: 459-2718 (email is better!)
E-mail: lewis at ucsc dot edu

TAs: Rob Carman and Christopher Toni
Office: 4117 McHenry
Office hours: TBA

TIMES

Lecture: MWF 9:30-10:40 AM, Kresge 321

Sections:
A: MW 5:00-6:45 PM Eight Acad 252
B: MW 7:00-8:45 PM Eight Acad 252
C: TuTh 6:00-7:45 PM Porter Acad 144
D: TuTh 8:00-9:45 PM Porter Acad 144

Office hours: D.L.: Tuesday 12:00-1:30, Friday 11:15-12:45, and by appointment

TEXTS

Introduction to Linear Algebra, fourth edition, by Gilbert Strang

A First Course in Linear Algebra (version 2.90), by Robert Beezer

ADDITIONAL RESOURCES

MIT OpenCourseWare site for Linear Algebra Includes videos and transcripts of all lectures in Gil Strang's course at MIT in Fall, 1999, additional tutorial videos, and links to homework and exams (including solutions) from multiple offerings at MIT. HIGHLY RECOMMENDED

Mathematica "demonstrations" on dozens of topics (need Mathematica or free Player).

Linear Algebra, by Jim Hefferon (free online text, with lots of exercises and complete solution manual); download from Hefferon's website.
Gaussian elimination tool, by Marek Rychlik. This online app generates a detailed step-by-step calculation with comments. If you're not sure how to input your matrix, click the Show/Hide help button. The jargon in options will be covered in the course.

TYPOS AND COMMENTS ON THE TEXT

page 22, eqn 4: **Typo:** The 3-3 entry of the matrix (third entry of the third row) should be 1, not 0.

   **Comments:** \(x_0\) is not given; Strang is introducing that symbol on the fly. In the context of differential equations, it would be clear, but not here.

page 518: **Typo:** Problem Set 2.1, page 40. The solution for problem 11 is given, not problem 12.

TENTATIVE LECTURE SCHEDULE

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<th>Monday</th>
<th>Wednesday</th>
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<td><strong>October 1</strong> dot products</td>
<td><strong>October 3</strong></td>
<td><strong>September 28</strong> 1.1. Vectors and linear combinations</td>
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<tr>
<td><strong>October 8</strong> elimination</td>
<td><strong>October 10</strong></td>
<td><strong>October 5</strong> 2.1. Vectors and linear equations</td>
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<td><strong>October 15</strong> matrices</td>
<td><strong>October 17</strong> 2.6. Elimination = factorization</td>
<td><strong>October 12</strong> 2.4. Rules for matrix operations</td>
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<td><strong>October 22</strong> vectors</td>
<td><strong>October 24</strong> 3.2. The nullspace of A</td>
<td><strong>October 19</strong> 2.7. Transposes and permutations</td>
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<td><strong>November 5</strong> 3.4. The complete solution to (A \times b)</td>
<td><strong>October 31</strong> MIDTERM</td>
<td><strong>November 2</strong> 3.5. Independence, basis, and dimension</td>
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<td><strong>November 5</strong> 3.5. More on bases and dimension</td>
<td><strong>November 7</strong> 3.6. Dimensions of the four subspaces</td>
<td><strong>November 9</strong> 5.1. Properties of determinants</td>
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<td><strong>November 12</strong> HOLIDAY</td>
<td><strong>November 14</strong> 5.2. Permutations and cofactors</td>
<td><strong>November 16</strong> 5.3. Cramer's Rule, inverse, and volumes</td>
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<td><strong>November 19</strong> 6.1. Introduction to eigenvalues</td>
<td><strong>November 21</strong> 6.1. The equation for the eigenvalues</td>
<td><strong>November 23</strong> HOLIDAY</td>
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<td><strong>November 26</strong> 6.2. Diagonalizing a matrix</td>
<td><strong>November 28</strong> 6.2. Diagonalization continued</td>
<td><strong>November 30</strong> 6.3. Applications of diagonalization</td>
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<td><strong>December 3</strong> 7.1. The idea of a linear transformation</td>
<td><strong>December 5</strong> 7.2. The matrix of a linear transformation</td>
<td><strong>December 7</strong> TBA/wiggle room</td>
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FINAL EXAM: Wednesday, December 12, 12:00-3:00 P.M.
HOMEWORK POLICIES

There will be weekly homework assignments, assigned in class on Fridays and due by 2:00 PM the following Friday, unless otherwise specified.

Homework can be submitted in section, in lecture on Friday morning (you must put your assignment in the appropriate section folder), or in the homework drop-off cabinet on the first floor of McHenry. Homework will be returned in section.

To comply with privacy guidelines, you will be given a three letter code name (randomly selected from a list of US airport codes). Every assignment should have a cover page with only your code name, the assignment number, your section letter and time, the date, and the course name. For example:

LAX
Homework #1
Section B, MW 7:00
October 5, 2012
Linear Algebra

Your real name should be at the top of every inside homework page. Your actual name (nicknames are OK, but please include your surname as known to UCSC) will be used when recording scores. The code name is just for privacy when graded work is being returned.

Your two lowest homework scores will be dropped when your homework average is computed.

Late homework will not be accepted. (We don't have the grader hours to spare, and it's not fair to the graders to ask them to collect and process off-schedule assignments without extra compensation. Dropping the two lowest homework scores should provide protection against minor unexpected complications.)

You must justify your answers. In particular, the "Answers to selected exercises" at the back of the book are very cryptic, and are only intended to let you know if you're on the right track or not. Submitting word-for-word what's in the back of the book for a given problem will typically not get you full credit for that exercise.

Your homework should be neatly written and well-organized, with the pages securely fastened together and your name on every page. Exercises may involve several nontrivial steps; make it clear to your readers (and yourself!) what you're doing at each step.

Clearly number the exercises and try to submit them in numerical order; if any problems are out of sequence, indicate that at the beginning of the assignment. The grader should not have to hunt through several pages to find a particular problem. (You don't need to solve them in order, just submit them in order.)

GRADING

Your overall course score will be the best of at least three different weighted averages of your midterm score, your final exam score, and your average homework score (with two lowest homework scores dropped). For example, one combination will be midterm 30%, final 45%, homework 25%. Two other weightings will be the "all's well that ends well" combo, with the midterm weighted very lightly, the final weighted very heavily, and homework given moderate weight, and the "if you really don't need it" combo, in which homework is weighted very lightly. I prefer not to assign exact percentages to these weightings...
until I see how the midterm scores and early homework scores look.

Letter grades will be based on ranking by overall course score. Participation in section and in office hours, contributions to the Piazza page, etc. will not be assigned numerical values, but can bump a borderline grade to the sunny side of the cut-off.

The grading is curved; I do not set score cut-offs in advance, or assign X% A's, Y% B's, and so on. Whenever possible, I place the cut-offs in gaps in the score distribution, so that I don't have two students with very close overall scores getting different letter grades (unless their participation levels were very different.)

I do not assign letter grades to individual exam scores or the homework average. Please do not ask me what grade you got on the midterm, or what grade it would have been if I'd given it a grade. Your course grade is based on weighted averages of numerical scores, not "averages" of letters of the alphabet. Don't go there.