### 18.06 Linear Algebra, Fall 2011

Lecturer: Alan Edelman (office 2-343, email: edelman@math )
Lecture hour: $\quad$ MWF at 11am in room 34-101
Course Administrator: Yan Zhang (office: 2-487, email: yanzhang@math)

*     * Course Web Page: http://web.mit.edu/18.06/ (handouts, announcements, etc.).

Textbook: Introduction to Linear Algebra (4th edition) by Gilbert Strang.
Recitations: You must enroll in a specific section (they are listed on web.mit.edu/18.06/). Your homework and exams will go to that section. Changes are made through the Stellar Course Management Website:

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http://stellar.mit.edu/S/course/18/fa11/18.06/.
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A link to the course management website is also available on the 18.06 web page.

*     * Your recitation instructor (not your lecturer!) is the person to ask all questions about homework and grades.

Homework: Assignments will be due on Thursdays by 4PM. Please put them in the box for your section in $2-114$. Please staple them (you may use the UMO stapler). They are due every week and are returned in recitation. Late homework will not be accepted and no extensions are granted.

The homeworks are essential in learning linear algebra. They are not a test and you are encouraged to talk to other students about difficult problems - after you have found them difficult. Talking about linear algebra is healthy. But you must write your own solutions.

Exams: There will be three one-hour exams at class times on:

- Wednesday October 5 (split between 1-190 and 34-101.)
- Friday November 4 (Walker Memorial)
- Monday December 5 (Walker Memorial)

The Final will be Thursday Dec 22, du Pont, during 9AM-12 Noon.
The use of calculators or notes is not permitted during the exams.
Grading: Problem sets 15\%, three one-hour exams $45 \%$ ( $15 \%$ each), final exam $40 \%$.
SOFTWARE: Some homework problems will require you to a numerical linear algebra tool. Examples of these include Maple, Mathematica, MATLAB, Octave, Python, R, Scilab. These are available at MIT on Athena and other systems.
http://web.mit.edu/matlab/www/.
The above web page has more information on one popular system, MATLAB, including a tutorial. (No previous MATLAB or any numerical algebra experience is required in 18.06. The exercises will not be programming-intensive. Exams will not ask for any one language, but may cover concepts that are language independent.)

Videos: Videos of Professor Strang's lectures in an earlier year are available on the course web page and also at ocw.mit.edu.

## Syllabus for 18.06 Linear Algebra, Fall 2011 MWF 11-12 Room 34-101

The three midterm exams will be held during lecture hours (closed book).
All grading questions should go to your recitation instructor!

| W | 9/07 | The Geometry of Linear Equations | 1.1-2.1 |
| :---: | :---: | :---: | :---: |
| F | 9/09 | Elimination with Matrices | 2.2-2.3 |
| M | 9/12 | Matrix Operations and Inverses | 2.4-2.5 |
| W | 9/14 | $A=L U$ and $A=L D U$ Factorization | 2.6 |
| F | 9/16 | Permutations, Dot Products, and Transposes | 2.7 |
| M | 9/19 | Vector Spaces and Subspaces | 3.1 |
| W | 9/21 | [STUDENT HOLIDAY] |  |
| F | 9/23 | The Nullspace: Solving $A x=0$ | 3.2 |
| M | 9/26 | $A x=b$ for nonsquare $A$, Row-reduced Echelon Form | 3.3-3.4 |
| W | 9/28 | Independence, Dimension, and Bases | 3.5 |
| F | 9/30 | The Four Fundamental Subspaces | 3.6 |
| M | 10/03 | EXAM REVIEW |  |
| W | 10/05 | Exam 1: Chapters 1 to 3.5 |  |
| F | 10/07 | Graphs and Networks ([ADD DATE $]$ ) | 8.2 |
| M | 10/10 | [COLUMBUS DAY] |  |
| W | 10/12 | Orthogonality and Subspaces | 4.1 |
| F | 10/14 | Projections | 4.2 |
| M | 10/17 | Least Squares Approximations | 4.3 |
| W | 10/19 | Orthonormal Bases, Gram-Schmidt, and $A=Q R$ | 4.4 |
| F | 10/21 | Fourier Series and Orthogonal Polynomials | 8.5 |
| M | 10/24 | Properties of Determinants | 5.1 |
| W | 10/26 | Formulas for Determinants; Jacobians | 5.2-5.3 |
| F | 10/28 | Eigenvalues and Eigenvectors | 6.1 |
| M | 10/31 | Similar Matrices, Diagonalization, and Powers of $A$ | 6.2, 6.6 |
| W | 11/02 | EXAM REVIEW |  |
| F | 11/04 | Exam 2: Chapters 1 to 5.3 and 8.2, 8.5 |  |
| M | 11/07 | Markov Matrices | 8.3 |
| W | 11/09 | Differential Equations | 6.3 |
| F | 11/11 | [VETERAN'S DAY] |  |
| M | 11/14 | Symmetric Matrices | 6.4 |
| W | 11/16 | Positive Definite Matrices | 6.5 |
| F | 11/18 | Defective Matrices: Jordan Form, Generalized Eigenvectors | 6.6 |
| M | 11/21 | Singular Value Decompositions | 6.7 |
| W | 11/23 | Matrices in Engineering ([DROP DATE]) | 8.1 |
| F | 11/25 | [THANKSGIVING] |  |
| M | 11/28 | Linear Operators on Functions |  |
| W | 11/30 | Sparse Matrices and Iterative Methods | 9.3 |
| F | 12/02 | EXAM REVIEW |  |
| M | 12/05 | Exam 3: Chapters 1 to 6.7 and 8.1, 8.3, 8.5 |  |
| W | 12/07 | Numerical Linear Algebra | 9.1-9.2 |
| F | 12/09 | Complex Matrices and FFTs | 10.1-3 |
| M | 12/12 | Catch Up |  |
| W | 12/14 | Course Review |  |
| F-T | 12/16-22 | Final Exam Period |  |

