ENG EK 102: Introduction to Linear Algebra for Engineers
Fall 2015

INSTRUCTOR
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Office hours:

TEACHING FELLOW
TBD

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MEETING TIMES AND PLACES

Lectures:
A1: Tuesdays, 2-4 pm (SED 130)

Discussion sections:
A2: Mondays, 10-11 am (PRB 148)
A3: Tuesdays, 11 am - 12 pm (EPC 204)

Due to both limited seating and the way the course is run, students must go to their assigned section. They are not interchangeable!

INTRODUCTION AND COURSE GOALS

This is a course on understanding, solving, and using systems of linear equations and matrices. The course focuses on the mathematical tools of vector spaces, linear transformations, matrices, determinants, and eigenvalues and eigenvectors. Examples are drawn from engineering applications to motivate the material.

COURSE PREREQUISITES

Technically, EK 127 or similar. Essentially, you should be able to use Matlab. Co-registration with EK 127 is also ok.

COURSE DELIVERABLES AND GRADING

There will be weekly problem sets. You are free to discuss the problems with others, though you are strongly encouraged to first try them by yourself. As usual, in the end you must work the problem yourself and turn in your own effort. Your lowest problem set score will be dropped. Problem sets are due at the start of lecture and will be returned in the section.

There will be weekly quizzes to be taken in section. These will cover the homework turned in the previous week. This will give you a chance to review the solutions as well as motivate you to review the previous material. Note that in general you will not yet have received your homework back after grading when you take the quiz. The solutions will be available, though, pretty much right after you turn in the homework. Your lowest quiz score will be dropped.

Group work is an essential part of the way that I teach. To make this most effective, it is essential that everyone (yes, this means YOU) read the assigned material prior to lecture. To help ensure this, every lecture will begin with a very short quiz on the reading. Since we will have not yet covered that material in lecture, grading will be liberal.

There will be one in-class midterm that will cover material through problem set 5.

There will be a final during the final exam period. The date is yet to be determined. **Do not make your travel plans until we learn this date!**

Your course grade will be based on the weightings below.

- (5%) In-class preparatory quizzes
- (10%) Homework
- (15%) Quizzes
- (30%) Midterm
- (40%) Final

COURSE WEBSITE

A website has been setup on Piazza. You should have received an invitation to join the site; if not please let me know ASAP. All material will be disseminated through the site. In addition, as many of you probably know, the hallmark of Piazza is its online forum for discussion. You can post questions, answer questions from your fellow classmates, rank responses, and so on. I and the TA will be monitoring the site and responding to questions as well, though in general we will try and let the class come to a consensus answer. Please use this! It's surprising helpful.

DROP AND WITHDRAWAL DATES

The last day to **drop** the class (without a W appearing on your transcript) is 10.07.2015.

The last day to **withdraw** from the class (with a W appearing on your transcript) is 11.06.20145.

TEXTBOOK AND REFERENCES

The primary textbook is G. Strang, Introduction to Linear Algebra, Fourth Edition, Wellesley-Cambridge Press, 2009. The previous edition of the book is also acceptable.

Prof. Strang (at MIT) offers his linear algebra course through the MIT OpenCourseWare sites. You can find lots of good videos, worked problems and exams, and other materials. Check it out at:

http://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/

Really, go check it out. Do it now. Right now. Unless you're in my lecture reading this. Then wait until later please.

Schedule for Fall 2015

Week	Date	Text	Topics	Due
1	09.08.15	Ch. 1	Course overview 1.1: Vectors and linear combinations 1.2: Dot product, matrices Application: coding	
2	09.15.15	Ch. 2.1-4	2.1: Linear equations 2.2: Elimination Application: Linear programming	PS 1 (lecture) Prep. quiz on text (lecture)
3	09.22.15	Ch. 2-5, 3.1	3.1: Matrix inverse 3.2: Column space Application: Markov matrices and economics	Quiz 1 on PS 1 (section) PS 2 (lecture) Prep. quiz on text (lecture)
4	09.29.15	3.2-4	4.1: Null space 4.2: Solving $Ax = b$ Application: Cryptography	Quiz 2 on PS 2 (section) PS 3 (lecture) Pre. quiz on text (lecture)
5	10.06.15	Ch. 3.5-6	5.1: Basis and dimension 5.2: The four subspaces Application: Finite element method	Quiz 3 on PS 3 (section) PS 4 (lecture) Prep. quiz on text (lecture)
6	10.13.15	-	No lecture - Monday schedule	
7	10.20.15	Ch. 4.1-2	7.1: Orthogonality of the four subspaces 7.2: Projections Application: Moment about an axis	Quiz 4 on PS 4 (section) PS 5 (lecture)
8	10.27.15	-	Midterm exam (weeks 1-5)	-
9	11.03.15	Ch. 4.3-4.4	9.1: Least squares approximation 9.2: Orthogonal bases and Gram-Schmidt Application: System identification	Quiz 5 on PS 5 (section) PS 6 (lecture) Prep. quiz on text (lecture)
10	11.10.15	Ch. 5.1,6.1	10.1: Determinants 10.2: Introduction to eigenvalues Application: Dynamic systems and control	Quiz 6 on PS 6 (Section) PS 7 (lecture) Prep. quiz on text (lecture)
11	11.17.15	Ch. 6.1-2	11.1: Eigenvalues and eigenvectors 11.2: Matrix diagonalization Application: PCA and Bioinformatics	Quiz 7 on PS 7 (section) PS 8 (lecure) Prep. quiz on text (lecture)
12	11.24.15	Ch. 6.3, 6.6	12.1: Application to ODEs 12.1: Similar matrices and Jordan form Application: Google and PageRank	Quiz 8 on PS 8 (section) PS 9 (lecture) Prep. quiz on text (lecture)
13	12.01.15	Ch. 7.1-2	13.1: Linear transformations 13.2: Matrices as operators Application: Compressive sensing	Quiz 9 on PS 9 (section) PS 10 (lecture) Prep. quiz on text (lecture)
14	12.08.15	Ch. 7.3	14.1: Pseudoinverse 14.2: Extra topic: Numerical linear algebra Application: TBD	Quiz 10 on PS 10 (section) PS 11 (lecture) Prep. quiz on text (lecture)