MAS109 Introduction to Linear Algebra, *corrected March 4, 2014*

2014 spring

Instructors

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Course Outline

Linear Algebra is widely used in physics, chemistry, biology, computer science, engineering, economics, finance and business. This course covers linear independence, vector space, basis, dimension, inverse matrix, determinant, rank, eigenvalue, eigenvector, orthogonal matrix, diagonalization, LU-decomposition, and singular value decomposition. The goal of this course is to learn how to solve systems of linear equations with practical applications in mind.

Textbook

"Contemporary Linear Algebra" by H. Anton and R.C. Busby, John Wiley & Sons, Inc.

Evaluation

Midterm (30%), Final (40%), Quiz (20%), Class Attendance (10%)
Students who miss either midterm or final exam will get the final grade 'F'.
Course grades will be determined by a relative scale based only on scores of first-time takers.
For repeaters, the possible highest course grade is **A-**.

Homework

You do not have to hand in your homework. Instead you practice with the n-th week's homework to prepare for the (n+1)-st week's quiz.

Recitation Class

There will be a one-hour recitation class each week except for the first two weeks. Each section is run by a TA and accommodates about 30 students.

MATLAB

Every week, MATLAB problems are assigned. Students are required to submit MATLAB assignments to their TA's, there will be MATLAB problems in the midterm and final exam.

2014 Spring Lecture Schedule

Weeks	Topics to be covered	Sections	Homework
Week 1	- Solving linear system by row reduction and some operations on matrices	**§ 2.1-2, 3.1**	**§2.1** 8, 12, 25,31, D9 **§2.2** 11,25,40,44,D4 **§3.1** 8,20,24,26,D9,P2
Week 2	- Inverse and elementary matrices - Subspaces and linear independence	**§ 3.2-4**	**§3.2** 21,32,34,D1,D2 **§3.3** 16,25,32,D6,P6 **§3.4** 16,20,24,28,D6,P1
Week 3	- The geometry of linear systems - Matrices with special forms and LU decomposition	**§ 3.5-7**	**§3.5** 2,8,16,D4,P4 **§3.6** 6,14,18,26,28,D10 **§3.7** 10,14,18,D3
Week 4	- Determinants, cofactor expansion - Properties of determinants	**§ 4.1-2**	**§4.1** 12,20,34,35,D5 **§4.2** 6,20,22,26,38,D8
Week 5	- Cramer's rule - Eigenvalues and eigenvectors - Matrices as transformations	**§ 4.3-4, 6.1**	**§4.3** 12,18,33,36,48,50 **§4.4** 2,12,26,31,D8,P7 **§6.1** 10,23,27,32,D4
Week 6	- Geometry of linear operations - Kernel and range - Composition and invertibility	**§ 6.2-4**	**§6.2** 13,15,24,30,D6 **§6.3** 6,10,16,20,D1,P1 **§6.4** 6,8,14,22,24,D1
Week 7	- Basis and dimension - Properties of bases	**§ 7.1-2**	**§7.1** 2,6,8,12,D2,D4 **§7.2** 8,16,18,D1,D2,P5
Week 8	**Midterm Exam**		
Week 9	- The fundamental spaces of a matrix - The dimension theorem - The rank theorem	**§7.3-5**	**§7.3** 8,24,32,D2,P4 **§7.4** 8,14,24,D1,P4 **§7.5** 10,14,18,D4,P1
Week 10	- The pivot theorem	**§7.6**	**§7.6** 6,10,14,16,D2
Week 11	- The projection theorem - Best approximation and least squares	**§7.7-8**	**§7.7** 4,20,26,D5,P3 **§7.8** 2,4,8,14,P2
Week 12	- The Gram-Schmidt process - Coordinate change	**§7.9, 7.11**	**§7.9** 6,12,26,39,D5 **§7.11** 12,18,20,26,P2
Week 13	- Matrix representations of linear transformations - Similarity and diagonalizability	**§8.1-2**	**§8.1** 16,24,30,D4,P3 **§8.2** 10,18,26,D3,D4
Week 14	- Orthogonal diagonalizability - Quadratic forms	**§8.3-4**	**§8.3** 10,18,28,D1,P2 **§8.4** 8,16,18,32,34,D2
Week 15	- Singular value decomposition	**§8.6**	**§8.6** 4,10,20,22,D1
Week 16	**Final Exam**		

- June 4, 2014, Wednesday (Week 14) is the Election Day and there is no class!