MATH 310, APPLIED LINEAR ALGEBRA
FALL 2015 SYLLABUS

COURSE DESCRIPTION: The course will focus on matrix and vector methods for studying systems of linear equations, with an emphasis on concrete calculations and applications. Specific topics to be covered include matrices, Gaussian elimination, vector spaces, *LU*-decomposition, orthogonality, the Gram–Schmidt process, determinants, inner products, eigenvalue problems, and applications to differential equations and Markov processes.

Math 210 is a prerequisite; credit will not be given for both Math 310 and Math 320.

MEETINGS: MWF, 1:00-1:50, Lecture Center D5

TEACHING STAFF: Instructor: John Lesieutre (luh-SEERT)
Email: `jdl@uic.edu`
Office hours: SEO 411, Tu 3-4, Th 10-11, F 3-4
or by appointment (really!)
Online, Tu evening (`math310john@gmail.com` on gchat)

Teaching Assistant: Cara Mullen
Email: `cmulle4@uic.edu`

TEXTBOOK: *Linear Algebra and Its Applications* (5^{th} edition) by David C. Lay, Steven R. Lay, and Judi J. McDonald. (Note: the 4^{th} edition is similar and should be fine for the readings, but you should check homework problems from the book against the 5^{th}.)

WEBSITES: There are three sites for the course:

Course materials: My site (`http://jdl.people.uic.edu/courses/m310f15/`)
Grades: Blackboard (`http://blackboard.uic.edu/`)
Q&A: Piazza (`https://piazza.com/uic/fall2015/310/home`)

IMPORTANT DATES: There will be three exams throughout the semester: two midterms (W 9/30, W 11/11), and the final (M 12/7, 1-3 PM) . The precise topics on the midterms will be announced closer to the dates. Arrangements for make-up exams should be made *before* the date of the exam.

The add/drop deadline is 9/4. The withdraw deadline is 10/30.

HOMEWORK AND QUIZZES: Homework problems will be assigned every week, but will not be graded. Problems on the material for the week will all be posted by Wednesday, and should be completed by the following Wednesday.

You are strongly encouraged to work through all the homework problems and to discuss them with your classmates. Discussions of homework problems are fair game on the Piazza discussion forum.

Every Wednesday there will be a quiz with a problem similar to one from the homework due that day, drawn from material covered during the preceding week. Your ten best quizzes will count for 20% of your final grade.

GRADING: The breakdown of the grades is as follows: Quizzes, 20%; Midterm 1, 20%; Midterm 2, 20%; Final, 40%.

QUESTIONS: Please ask questions! There are several ways to reach me outside of the lectures, and I'll try to respond quickly:

Piazza:	Q&A site. The best option for math-related questions.
Email:	You can reach me at `jdl@uic.edu`.
Office hours:	Stop by to talk about homework, etc.
Course page:	An anonymous email contact form is available on the course website if you have any questions/suggestions you wouldn't share otherwise. Remember that I won't be able to answer if you don't leave your address.

ATTENDANCE: Students are expected to attend every lecture, and should let me know ahead of time if they will miss one. I will occasionally pass around a sign-in sheet during the lecture; students who miss more than four of these will lose 3% from the final grade for each absence.

OTHER RESOURCES:

MSLC:	The Mathematical Sciences Learning Center is located in SEO 430. It offers a place to study and get help with Math 310 throughout the semester. Fall 2015 hours are 8:00 AM to 6:00 PM, M-F.
OCW:	You can find lecture videos from the MIT offering of a similar course at `http://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/`. Coverage of the two courses is broadly similar and some students have found these helpful in the past.

THE OTHER SECTIONS: A warning: although there are several sections of Math 310 running in parallel, they are not coordinated, and the topics covered, exam dates, etc. won't necessarily coincide (although they are likely to be very similar).

While you are of course encouraged to talk to your friends in the other sections about the material, be sure to check dates, exam coverage etc. for this section only.

ACADEMIC INTEGRITY: Instances of academic misconduct will be handled according to the Student Disciplinary Policy.

DISABILITY ACCOMODATIONS: Students with disabilities who require accommodation should register with the Disability Resource Center (DRC).

ROUGH CALENDAR

(subject to change)

Week 1		
8/24	§1.1	Linear systems
8/26	§1.2	Row reduction and echelon forms
8/28	§1.3	Vector equations
Week 2		
8/31	§1.4	The matrix equation $A\mathbf{x} = \mathbf{b}$
9/1	§1.5	Solution sets of linear systems
9/3	§1.6	Applications of linear systems
Week 3		
9/9	§1.7	Linear independence
9/11	§1.8	Linear transformations
Week 4		
9/14	§1.9	Matrix of a linear transformation
9/16	§1.10	Linear models in business, science, and engineering
9/18	§2.1	Matrix operations
Week 5		
9/21	§2.2	Inverse of a matrix
9/23	§2.3	Characterization of invertible matrices
9/25	§2.5	Matrix factorization
Week 6		
9/28	§3.1	Introduction to determinants
9/30		Test 1
10/2	§3.2	Properties of determinants
Week 7		
10/5	§3.3	Cramer's rule, volume and linear transformations
10/7	§4.1	Vector spaces and subspaces
10/9	§4.2	Null spaces, column spaces, and linear transformations
Week 8		
10/12	§4.3	Linearly independent sets; bases
10/14	§4.4	Coordinate system
10/16	§4.5	The dimension of a vector space
Week 9		
10/19	§4.6	Rank
10/21	§4.7	Change of basis
10/23	§5.1	Eigenvectors and eigenvalues
Week 10		
10/26	§5.2	The characteristic equation
10/28	§5.3	Diagonalization
10/30	§5.4	Eigenvectors and linear transformations
Week 11		
11/2	Appendix B	Review of complex numbers
11/4	§5.5	Complex eigenvalues
11/6	§4.9	Applications to Markov chains

Week 12		
11/9	§5.7	Applications to differential equations
11/11		Test 2
11/13	§6.1	Inner product, length and orthogonality
Week 13		
11/14	§6.2	Orthogonal sets
11/16	§6.3	Orthogonal projections
11/18	§6.4	The Gram–Schmidt process
Week 14		
11/23	§6.5	Least-squares problems
11/25	§6.6	Application to linear models
Week 15		
11/30	§6.7	Inner product spaces
12/2	§7.1	Diagonalization of symmetric matrices
12/4	§7.4	The singular value decomposition
Week 16		
12/7		Final exam (1-3 PM)