

Math 2331-01 (20301): Linear Algebra

Fall 2017, MWF 11:00 am–12:00 pm

Instructor Andreas Mang

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🌐 <https://www.math.uh.edu/~andreas>

Office PGH 614

Office Hours MW 1:00 pm–2:00 pm or by appointment (andreas@math.uh.edu)

Class Time and Place MWF 11:00 am–12:00 pm in SEC 105

Course Website <https://www.math.uh.edu/~andreas/teaching/math2331-FA17/>

Information contained in this syllabus is subject to change without notice. This syllabus provides a general guideline for the course; deviations may be necessary. Students are expected to be aware of any additional course policies presented by the instructor during the course.

1 Prerequisites

Credit for or concurrent enrollment in MATH 1432.

2 Textbook

Linear Algebra and Its Applications, 4th Edition, by David C. Lay. ISBN10: 0321385179 ISBN13: 9780321385178

3 Course Content

Linear Algebra, rich in applications within mathematics and to many other disciplines, is potentially the most interesting and worthwhile undergraduate mathematics course you will complete. For many of you this is the first course to begin bridging the gap between concrete computations and abstract reasoning. Later in your career, computers will do the calculations, but you will have to choose the calculations, know how to interpret the results, and then explain the results to others. Understanding the notions of vector spaces, linear (in)dependence, dimension, and linear transformations will help you make sense of matrix manipulations at a deeper level, clarifying the underlying structure. A key aim of this course is that you will not only be equipped with a computational ability but with the ability to use these notions in their natural scientific contexts, and with an appreciation of their mathematical beauty and power.

4 Recommended References & Other Readings

Course material will be made available section by section on the course website: <https://www.math.uh.edu/~andreas/teaching/math2331-FA17/>. A detailed, tentative schedule can be found below.

week	date	topic	chapter
1	08/21	Systems of Linear Equations	Linear Equations
	08/23	Row Reduction and Echelon Forms	
	08/25	Vector Equations	
2	08/28	The Matrix Equation $\mathbf{Ax} = \mathbf{b}$	
	08/30	Solutions Sets of Linear Systems	
	09/01	Linear Independence	
3	09/04	UH Holiday (no class)	
	09/06	Introduction to Linear Transformations	
	09/08	The Matrix of a Linear Transformation	
4	09/11	Matrix Operations	Matrix Algebra
	09/13	The Inverse of a Matrix	
	09/15	Characterization of Inverse Matrices	
5	09/18	Partitioned Matrices	
	09/20	Matrix Factorization	
	09/22	<i>Review/Catch up/Special Topics</i>	
6	09/25	Midterm Exam #1	
	09/27	Subspaces of \mathbb{R}^n	
	09/29	Dimension and Rank	
7	10/02	Properties of Determinants	Determinants
	10/04	Cramer's Rule; Volume, and Linear Transformations	
8	10/06	Vector Spaces and Subspaces	Vector Spaces
	10/09	Null Spaces, Column Spaces, and Linear Trans.	
	10/11	The Dimension of a Vector Space	
	10/13	Rank	
9	10/16	Change of Basis	
10	10/18	Eigenvectors and Eigenvalues	Eigenvalues & Eigenvectors
	10/20	The Characteristic Equation	
	10/23	Digitalization	
	10/25	Eigenvectors and Linear Transformations	
	10/27	<i>Review/Catch up/Special Topics</i>	
11	10/30	Midterm Exam #2	
12	11/01	Iterative Estimates for Eigenvalues	Orthogonality & Least Squares
	11/03	Inner Product, Length, and Orthogonality	
	11/06	Orthogonal Sets	
	11/08	Orthogonal Projections	
	11/10	The Gram-Schmidt Process	
13	11/13	Least-Squares Problems	Sym. Matrices & Quadratic Forms
	11/15	Diagonalization of Symmetric Matrices	
	11/17	Quadratic Forms	
14	11/20	The Singular Value Decomposition	
	11/22	UH Holiday (no class)	
	11/24	UH Holiday (no class)	
15	11/27	Review/Catch up/Special Topics	
	11/29	Review/Catch up/Special Topics	
	12/01	Review/Catch up/Special Topics	
	12/02	last day of class	
	12/11	final exam, 11am–2pm	

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5 Attendance Policy

Attendance is not required, but strongly encouraged. A student is considered present only if he/she has arrived on time and remains until the class is dismissed. Coming to class late or leaving early is disruptive and thus discouraged.

6 Dropping Policy

September 8, 2017 Official reporting day (ORD); drop a course without receiving a grade.

October 31, 2017 Last day to drop a course or withdraw with a 'W'.

7 Homework Assignments

Homework assignments will be given on a weekly basis. Homework assignments will consist of exercises taken from the textbook (see §2; "paper and pencil") and programming exercises (Matlab). They have to be handed in every Monday at the end of the class, i.e., 11:50 am, which will also be the *sharp* deadline for Matlab assignments to be sent to the specified email address (see the homework cover sheet for detailed instructions on how to hand in the homework); if your Matlab homework arrives at 11:51am you will get a score of zero. If you can not hand in your homework on the designated due date, stop by my office and hand it in *before the assigned due date*. A list of problems will be posted by the previous Monday. In fairness to fellow students and graders, late homework will generally not be accepted. However, your lowest homework score throughout the term will be dropped to allow for missed assignments.

It is expected that you express your ideas clearly, legibly, and completely, which often requires complete English sentences (i.e., a justification) rather than a long string of equations or unconnected mathematical expressions. Homework scores can not be changed one week after they have been returned. Homework can and should be worked on and discussed with others. Collaboration is a big part of learning and of scholarship in general. I strongly encourage you to participate in study groups with fellow students attending this course. However, your write-up of the homework has to be independent, and in your own words. Your homework needs to be complete, neatly written, and stapled.

8 Grading

The final grade for the class will be determined as follows:

test/midterm 1	20%
test/midterm 2	20%
homework and quizzes	30%
final exam	30%
total	100%

Final letter grades assigned for this course will be based on the percentage, x , of total points/semester score earned and are assigned as follows:

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letter grade	percentage
A	$90\% \leq x \leq 100\%$
B	$80\% \leq x < 90\%$
C	$70\% \leq x < 80\%$
D	$60\% \leq x < 70\%$
F	$x < 60\%$

The lowest two homework and quiz scores you obtained in this course will be dropped to allow for missed assignments. The lowest test/midterm exam score will be replaced by the grade of the final exam (with the appropriate 20% weighting for midterm exams), if your grade for the final exam is better. Grades for exams, quizzes, and homework assignments can be disputed until one week after they have been returned. After that your grade can not be changed.

9 Exams

During the semester there will be two midterm exams and one final exam. The exams will contain a mixture of computational and conceptual problems. Some of them will resemble homework problems and quizzes, while some may be brand new to you. Exams shall be worked on independently and without the use of your textbook, homework, and class notes. There will be no makeup exams. Exam grades can be disputed until one week after they have been returned. After that your grade can not be changed.

10 Makeup Policy

Not turning in homework by the assigned due date, missing a quiz, or not being present for an exam results in a *score of zero*. There will be *no* makeup assignments. Technology failures will not be accepted as reason for missed assignment due dates. Therefore, do not leave anything to the last minute. It is the student's responsibility to identify alternative ways to complete or submit an assignment.

Exceptions are possible in the case of extreme circumstances, such as a documented, serious illness. In the event that you cannot be present to turn in homework or take an exam on the day it is held you need to speak to me in advance, and make every attempt to do the work before (and not after) the rest of the class.

11 Academic Honesty/Honor Code

Plagiarism and cheating are serious offenses. The University policies on scholastic dishonesty will be strictly enforced (see Catalog/Student Handbook for more details).

12 Students Disability Services/Special Needs

If you have a disability and would like to request classroom accommodations, please see me after class or during office hours to discuss arrangements as soon as possible (see contact information above).

13 Mental Health/CAPS Statement

Counseling and Psychological Services (CAPS) can help students who are having difficulties managing stress, adjusting to college, or feeling sad and hopeless. You can reach CAPS (www.uh.edu/caps) by

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calling 713-743-5454 during and after business hours for routine appointments or if you or someone you know is in crisis. No appointment is necessary for the "Let's Talk" program, a drop-in consultation service at convenient locations and hours around campus. http://www.uh.edu/caps/outreach/lets_talk.html

14 Help

The Department of Mathematics has a mathematics laboratory, also known as CASA, located in 222 Garrison. There you will find student tutors who, on a walk-in basis, offer help with individual problems. The instructor is available for help during office hours. *All the information about this course will be posted regularly on the course website. Please check the site often.*

15 Cell Phones and Electronic Devices

During class and exam periods, all cell phones and other electronic devices must be turned off and kept in a secure location away from the students immediate view. The use of laptop computers in class is only permitted if students are using the computers to take notes or for purposes related to the class.