MATH 310: ELEMENTARY LINEAR ALGEBRA (FALL 2018)

Course number: MAT 310-01

Course title: Elementary Linear Algebra

Credits: 3

Meetings: MWF 11:00–11:50 am, Petty 007

Prerequisites: Grade of C or better in MAT 292

Instructor information:

Instructor: Dr. Dan Yasaki d_yasaki@uncg.edu
Homepage: http://www.uncg.edu/math/faculty/d_yasaki/teaching.html
Office Hours (146 Petty): Mon 2:00–3:30 pm, Tues 8:30–10:00 am, and by appointment

For whom planned: Mathematics majors and minors

Catalog description: Linear systems, matrices, determinants, eigenvalues and eigenvectors, finite-dimensional vector spaces, linear transformations.

Student learning outcomes: Upon successful completion of this course students shall be able to

- **SLO 1: define** basic terms associated with Linear Algebra, such as linear systems, linear transformations, matrices, linear independence, dimension, rank, null space, basis, vector space, eigenvalues/eigenvectors and orthogonality;
- **SLO 2: give examples** of spaces, linear maps or matrices exhibiting properties outlined in SLO 1 in addition to examples of diagonal matrices, invertible matrices, change of bases, and other topics;
- **SLO 3: explain** definitions and give precise statements of important theorems of Linear Algebra; and
- **SLO 4: construct** and **defend** coherent mathematical proofs of statements in Linear Algebra based on definitions and previous theorems.

Teaching methods and assignments for achieving learning outcomes:

- **Readings and Flashcards (RF):** Read the section, taking careful notes on the definitions and theorems. Work through the examples. Make flashcards for important terms and results. (SLO 1)
- **Videos and Exercises (VE):** Exercises are the most important way to actually "learn" mathematics. This is the same sort of practice that is used to learn to play tennis or learn to play the piano. One cannot learn these things by watching them on television or reading about them in a book any more than one can learn mathematics by watching a lecture or reading a mathematics book. Watch the videos and work through all the exercises. Seek help for the ones you don't know how to do. (SLO1–4)

This document was last modified on August 13, 2018.

Discussion Questions (DQ): Answer the discussion questions posted in Canvas. You will be able to see everyone's posts after you post your response. Use complete sentences. Be specific. Avoid ambiguous pronouns such as "it". (SLO 1–3)

In class Activities: Group work on activities designed to assess readings and highlight key concepts and techniques. (SLO 1–4)

HW Quizzes: There will be HW quizzes to check your completion of HW exercises. (SLO 1–3)

Quizzes: There will be short weekly quizzes where you should expect one or two problems—one asking you to state a definition or result and the second asking you to apply that definition or result in some way. (SLO 1–3)

Tests: Tests serve as the primary gauge of evaluation. (SLO 1–4)

Evaluation and grading: Semester averages are computed according to the syllabus, and letter grades are assigned to the following point scale. Grades are neither curved nor rounded. Plus/minus may be assigned for borderline cases.

A : 90.0–100 B : 80.0–89.9 C : 70.0–79.9 D : 60.0–69.9 F : Below 60

Participation: Participation in the course counts for 30% of your final grade. This is measured through VE, RF, HW Quizzes, and In class Activities, each counting 5% and DQ counting 10%. The VE, RF, and In class activities are marked for completion, as described in the rubric in Canvas. The HW Quizzes and DQ are marked for correctness. The rubric for DQ is given in Canvas.

Quizzes: There will be a weekly quiz on dates shown in Canvas. All quizzes are weighted equally. Quizzes count for 10% of your final grade. A score of 0 will be given for any unexcused missed quizzes.

Tests: Three tests count for a total of 30% of your grade each. The final exam counts for 30% of your final grade. The dates are given below. A score of 0 will be given for any unexcused missed tests.

(1) Test 1 (Wednesday, 9/19, in class), tentative
(2) Test 2 (Wednesday, 10/17, in class), tentative
(3) Test 3 (Monday, 11/19, in class), tentative
(4) Final exam (Monday, 12/03 at noon), fixed by University

Required text:

Lay, David C. *Linear Algebra and its Applications,* 4th ed., Pearson, 2012. ISBN 13: 978-0-321-38517-8.

A used textbook is fine. We will not use the CD or any associated software.

Academic Integrity Policy: Each student is required to sign the Academic Integrity Policy on all major work submitted for the course.

I have abided by the UNCG Academic Integrity Policy on this assignment.
Signature _____ Date _____

More information can be found at

https://osrr.uncg.edu/academic-integrity/ .

Additional information:

(1) UNCG seeks to comply fully with the Americans with Disabilities Act (ADA). Students requesting accommodations based on a disability must be registered with the Office of Accessibility Resources and Services (OARS) in 215 Elliott University Center, 334-5440, http://oars.uncg.edu .

(2) Assignments Policy: Assignments are due in class on the due date, and late after 5 pm that day. Late assignments will be accepted at the following lecture period for half credit.

(3) Absence Policy: You are responsible for all missed material. Any missed assignment, test, or final exam will result in a score of 0. Make-up tests and final exam will be given only if you receive prior approval for a valid excuse by contacting me at least one week in advance.

(4) Copyright Policy: Selling or purchasing notes from classes for commercial gain is a violation of the UNCG Copyright Policy.

http://policy.uncg.edu/copyright/

Any student who sells notes taken in class for commercial gain, or who purchases notes taken by another student for commercial gain, is in violation of this policy and, by extension, is committing a violation of the Student Code of Conduct.

http://sa.uncg.edu/handbook/student-code-of-conduct/

(5) Email Policy: All email correspondence should be made using your UNCG email account. You must check your email regularly for updates and announcements.

(6) Calculators are not allowed on tests, quizzes, or the final exam. There will be homework exercises that require the use of MATLAB or similar software.

Tentative Calendar					
Wk	Mon	Topics			Notes
1	8/13		1.1	1.2	
2	8/20	1.3	1.4	1.5, 1.6	Last day to adjust: Mon
3	8/27	1.7	1.8	1.9	
4	9/03	—	1.10	2.1, 2.2,	Labor Day
5	9/10	2.3	2.8	2.9	
6	9/17	Chpt 1&2 Review	**Test 1**	3.1, 3.2,	Test 1 on Chpt 1&2
7	9/24	3.3	4.1	4.2	
8	10/01	4.3	4.4	4.5	Last day to withdraw Fri
9	10/08	—	4.6	4.7	Columbus Day
10	10/15	Chpt 3&4 Review	**Test 2**	5.1	Test 2 on Chpt 3&4
11	10/22	5.2	5.3	5.4	
12	10/29	5.5	5.6	Chpt 5 Review	
13	11/05	6.1	6.2	6.3	
14	11/12	6.5	6.6	Chpt 5&6 Review	
15	11/19	**Test 3**	—	—	Test 3 on Chpt 5&6, Thanksgiving break
16	11/26	Review I	Review II	—	Last day 11/29
17	12/03	Final Exam	—	—	**Final Exam**: noon

Textbook topics

1.	**Linear Equations in Linear Algebra**
1.1	Systems of Linear Equations
1.2	Row Reduction and Echelon Forms
1.3	Vector Equations
1.4	The Matrix Equation $A\mathbf{x} = \mathbf{b}$
1.5	Solution Sets of Linear Systems
1.6	Applications of Linear Systems
1.7	Linear Independence
1.8	Introduction to Linear Transformations
1.9	The Matrix of a Linear Transformation
1.10	Linear Models in Business, Science, and Engineering
2.	**Matrix Algebra**
2.1	Matrix Operations
2.2	The Inverse of a Matrix
2.3	Characterization of Invertible Matrices
2.8	Subspaces of $\mathbb{R}^n$
2.9	Dimension and Rank
3.	**Determinants**
3.1	Introduction to Determinants
3.2	Properties of Determinants
3.3	Cramer's Rule, Volume, and Linear Transformations
4.	**Vector Spaces**
4.1	Vector Spaces and Subspaces
4.2	Null Spaces, Column Spaces, and Linear Transformations
4.3	Linearly Independent Sets; Bases
4.4	Coordinate Systems
4.5	The Dimension of a Vector Space
4.6	Rank
4.7	Change of Basis
5.	**Eigenvalues and Eigenvectors**
5.1	Eigenvectors and Eigenvalues
5.2	The Characteristic Equation
5.3	Diagonalization
5.4	Eigenvectors and Linear Transformations
5.5	Complex Eigenvalues
5.6	Discrete Dynamical Systems
6.	**Orthogonality and Least Squares**
6.1	Inner Product, Length, and Orthogonality
6.2	Orthogonal Sets
6.3	Orthogonal Projections
6.5	Least-Squares Problems
6.6	Applications to Linear Models