Math 221 - Linear Algebra
Oxford College of Emory University
Spring 2015

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Office Hours:	To be announced on Blackboard.

Course Content:

This course is designed to introduce the student to the basic notions of linear algebra. Topics include matrices, systems of linear equations, vector spaces, inner products, bases, linear transformations, eigenvalues, eigenvectors, and applications of these topics.

Course Objectives:

At the end of the course the student should:

- Use Gaussian Elimination to solve systems of linear equations and identify those with one solution, no solution, or an infinite number of solutions.

- Perform operations with matrices and demonstrate comprehension of the fundamental properties of matrices and its operations.

- Demonstrate comprehension of fundamental definitions used in the study of linear algebra such as vector spaces, span of a vector space, basis of a vector space, subspaces, linear transformations, etc.

- Know what an inner product is and its properties.

- Obtain the characteristic polynomial, eigenvalues, eigenvectors, diagonalization, and a basis for each eigenspace for a given square matrix.

- Know about some application of linear algebra to other areas.

Text:

Elementary Linear Algebra: Applications Version, Edition 10/11 by Howard Anton & Chris Rorres.
   During the first part of the course, you are required to read the book before coming to class, and working on a few selected problems. Hopefully that will help you develop the good habit of reading the text ahead of time.
   Any additional material needed for this class will be provided in class or via Blackboard at https://classes.emory.edu/.

Homework:

Homework problems from each section that we cover in the text will be provided on Blackboard. Although the homework will not be collected, a timely completion of these assignments is crucial to success in this course in addition to serving as an excellent preparation for the tests, quizzes and problem sets.

Grading Policy:

Students' grades are determined by performance on problem sets, quizzes, class participation, projects, tests, and a comprehensive final exam.

Class participation	60
Projects/Problem Sets/Quizzes	200
3 Tests	510
Final	230
Total	1000

Maximum grade cuts are as follows:

A	B	C	D	F
$900 - 1000$	$800 - 899$	$700 - 799$	$600 - 699$	$0 - 590$

Plus/minus grades may be assigned for percentages near the maximum grade cuts. Also, I reserve the right to amend, append, or otherwise make changes to the plan for the course.

Class participation:

Your participation grade will be assigned somewhat arbitrarily, but mostly generously. I hope that class will be active and interesting, specially in the first part of the course. Be prepared and involved and it will generally be a lot of fun. You are allowed three unexcused absences, and for each unexcused absence in excess of three I will deduct 8% of your "class participation" grade. I reserve the right to decide what is and what is not an excused absence.

The following are examples of behavior that will be counted as equivalent to an unexcused absence: rude behavior, nodding off, any sight or sound of your cellphone, surfing the internet on your computer, being late to class, leaving the room during class, unwillingness to participate in the assignments, etc. Hopefully breaks should not be needed to go to the bathroom, to answer your phone, etc. If such a break is needed, I expect an explanation.

Students are responsible for all material covered in class and any changes to the syllabus that may be announced. Any conflicts between the course schedule and religious holidays are to be negotiated in advance with me.

Problem Sets/Quizzes/Projects:

Due at the BEGINNING of class on the date indicated on the assignments. The problem sets will consist primarily of the assigned homework problems, but I may add additional questions from other sources. **You are allowed to receive help from anyone/anything to complete the problem sets**. However, you must be actively engaged in the process of completing the

assigned problems. Simply copying the work of another student and submitting it as your own will result in zero credit. **All work is expected to be neatly written, and points will be deducted for a lack of organization, illegible or sloppy work, and the inappropriate use of mathematical notation, even if answers found are correct**.

An undetermined number of quizzes will be given throughout the semester. Quizzes need not be announced ahead of time. **There is no provision for making up a quiz. You will receive a zero on any missed quiz.** Grades on quizzes are treated identically to those on problem sets.

Projects will be announced with at least a week in advance.

Tests:

The Oxford Honor Code applies to all tests and is an **individual effort** on all portions (except when announced otherwise). All tests are on a Thursday night from 7 - 10pm. The tentative schedule is:

⋆ Thursday, February 12th.   ⋆ Thursday, March 19th.   ⋆ Thursday, April 23rd.

Final Exam:

Comprehensive with no exemptions. **Make sure to check your final exam schedule before making any trip arrangements**.

Technology:

Although you are encouraged to use technology while doing your homework, in general no technology will be allowed in class, specially smart-phones. Unless stated otherwise, the use of smart-phones, calculators and other technology are prohibited during an assessment for grade, and it will result in an honor code violation.

Expectations:

They're high! I expect that you will read the text (several times) and attempt all the assigned homework (and more). I welcome your comments, criticisms, and suggestions. Please feel free to stop by my office or e-mail me with any concerns or questions that you may have.

Good luck and I hope this will be an enjoyable experience for all of you!

Honor Code:

The Honor Code of Oxford College applies to all work submitted for credit in this course. To receive credit for work submitted you must place your name on it. By placing your name on such work, you pledge that the work has been done in accordance with the given instructions and that you have witnessed no Honor Code violations in the conduct of the assignment.

Disclaimer:

Student work submitted as part of this course may be reviewed by Oxford College and Emory College faculty and staff for the purposes of improving instruction and enhancing Emory education.

Tentative List of Topics

1. Section 1.1: Introduction to Systems of Linear Equations;

2. Section 1.2: Gaussian Elimination

3. Section 1.3: Matrices and Matrix Operations

4. Section 1.4: Inverses; Algebraic Properties of Matrices

5. Section 1.5: Elementary Matrices and a Method for Finding the Inverse of a matrix

6. Section 1.7: Diagonal, Triangular, and Symmetric Matrices

7. Section 2.1: Determinants by Cofactor Expansion

8. Section 2.2: Evaluating Determinants by Row Reduction

9. Section 2.3: Properties of Determinants

10. Section 3.1: Euclidean Vector Spaces (2-space, 3-space, n-space)

11. Section 3.2: Norm and Dot Product

—————————————————— Test 1 ——————————————————

12. Section 3.3: Orthogonality

13. Section 3.4: The Geometry of Linear Systems

14. Section 4.1: Real Vector Spaces

15. Section 4.2: Subspaces

16. Section 4.3: Linear Independence

17. Section 4.4: Coordinates and Basis

18. Section 4.5: Dimension

19. Section 4.6: Change of Basis

20. Section 4.7: Row Space, Column Space and Null Space

—————————————————— Test 2 ——————————————————

21. Section 4.8: Rank, Nullity and Fundamental Matrix Spaces

22. Section 4.9: Matrix Transformations

23. Section 4.10: Properties of Matrix Transformations

24. Section 5.1: Eigenvalues and Eigenvectors

25. Section 5.2: Diagonalization

26. Section 6.1 Inner Products

27. Section 6.2: Inner Product Spaces

28. Section 6.3: Gram-Schmidt Process

29. Section 6.4: Best Approximation; Least Squares

30. Section 7.1: Orthogonal Matrices

31. Section 7.2: Orthogonal Diagonalization

32. Section 8.1: Linear Transformations (?)

33. Section 8.2: Isomorphism (?)

34. Section 8.2: Composition and Inverse Transformations (?)

————————————————————— Test 3 —————————————————————