**LINEAR ALGEBRA**

**MATH 2700.004**

**FALL 2013**

Instructor: Dr. J. Iaia
Office: GAB 420
Office Hours: MW 10-12, or by appt.
webpage: http://www.math.unt.edu/faculty-page-joe-iaia

Time: TR 11:00-12:20
Place: MATT 108
email: iaia@unt.edu

Text: David Lay, *Linear Algebra and its Applications, 4th ed*

Prerequisite: Math 1720 - Calculus 2

## GRADING POLICY

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|---|---|---|---|
| *Exam* 1 | *Sept.* 19 | 20% | |
| *Exam* 2 | *Oct.* 17 | 20% | |
| *Exam* 3 | *Nov.* 14 | 20% | |
| *Final* | *Dec.* 10 | 20% | 10:30am-12:30pm |
| *Homework* | *weekly* | 20% | |

**Exams**: Exams **must** be taken on the dates listed above. Exceptions will be considered *only* if one has **written documentation** certifying one's absence.

**Homework**: Homework will be assigned each class and collected weekly. Five problems will be chosen at random and graded. Homework is extremely important and students are highly encouraged to spend a lot of time working on the homework problems.

**Attendance**: **Students are responsible** for **all** work assigned and announcements made during any absence.

**Code of Conduct**: Students are expected to be *respectful of others* at all times. This includes keeping talk and other noise to a minimum while a lecture is in progress or an exam is being taken. Any student being disruptive may be dismissed from the class meeting. **Cheating** will **not** be tolerated and anyone found guilty of cheating may receive an F for the semester.

The **Student Evaluation of Teaching Effectiveness (SETE)** is a requirement for all organized classes at UNT. This short survey will be made available to you at the end of the semester, providing you a chance to comment on how this class is taught. I am very interested in feedback from students, as I work to continually improve my teaching. I consider the SETE to be an important part of your participation in this class.

**Students with disabilities**: It is the responsibility of students with disabilities to provide the instructor with appropriate documentation from the Dean of Students Office.

**Semester grades** are determined by averaging the grades on the 3 exams, the final exam, and the homework. Letter grades will be based on this average and will follow this scheme: **A 90- ;B 80-89; C 70-79; D 60-69; F -59**

## Course Description

As you might guess from the title, Linear Algebra is all about studying linear equations and linear operators. I once had a professor in graduate school who said that mathematicians understand how to do two things - calculus and linear algebra. Hopefully you know the basics from calculus so we will now start with that other topic that mathematicians understand. We will first study systems of linear equations which will lead to a discussion of matrices and matrix equations. This then leads to a discussion of linear transformations and finding the matrix associated with a linear transformation. Along the way we will have to learn about vectors and what it means for a set of vectors to be linearly independent and what the span of a set of vectors is. This will lead to the topics of vector spaces, subspaces, bases of a vector space, and dimension. We will also discuss the determinant of a matrix, eigenvectors, and eigenvalues.

## Course Objectives

At the end of this course, students should know how to solve a system of linear equations, know what a matrix is and how to row reduce a matrix to echelon form and/or reduced echelon form. Students should also know how to find the inverse of a matrix, the determinant of a matrix as well as Cramer's rule. Students should also know how to determine if a set is a vector space and how to find a basis of a vector space and find the dimension of a vector space. In addition, students should know how to find the matrix representation of a vector space with respect to a particular basis as well as the eigenvectors and eigenvalues of a matrix. Students should also know sufficient conditions for a matrix to be diagonalizable.

## Course Outline

Meeting 1: systems of linear equations, row reduction, and echelon forms

Meeting 2: vectors

Meeting 3: linear independence and linear transformations

Meeting 4: the matrix of a linear transformation

Meeting 5: matrix operations, matrix multiplication

Meeting 6: the inverse of a matrix and characterization of invertible matrices

Meeting 7: review for exam 1

Meeting 8: exam 1

Meeting 9: subspaces, the span of a set of vectors, and null space

Meeting 10: basis for a subspace

Meeting 11: dimension and rank

Meeting 12: determinants

Meeting 13: properties of determinants and Cramer's rule

Meeting 14: area, volume, and determinants

Meeting 15: review for exam 2

Meeting 16: exam 2

Meeting 17: vector spaces, null space and column space of a linear transformation

Meeting 18: dimension

Meeting 19: rank and change of basis

Meeting 20: eigenvectors and eigenvalues

Meeting 21: the characteristic equation

Meeting 22: diagonalization of matrices

Meeting 23: review for exam 3

Meeting 24: exam 3

Meeting 25: complex eigenvalues

Meeting 26: applications to differential equations

Meeting 27: inner products and orthogonality

Meeting 28: orthogonal projections and the Gram-Schmidt process

Meeting 29: diagonalization of symmetric matrices

Meeting 30: review for final exam

Meeting 31: final exam