**MATH 215 Linear Algebra Fall 2015**

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**Text**: *Linear Algebra* by David M. Clark

**Where your grade comes from:**

* **Presentations and discussion**: The majority of the class time will consist of students presenting solutions/proofs of the problems/theorems from the text. At the end of the course each student will be assigned a presentation grade which will be based on the quality of your work and mastery of the course content. Please note that this grade is not based on quantity. This portion of your grade also includes your discussion and critique of the work of your classmates. Feel free to ask me for an update on how your presentation grade is doing anytime during the semester.
* **Homework**: Some problems from the textbook will be turned in as homework problems. These problems won’t be presented in class.
* **Projects**: There will be projects assigned to supplement the material in the text.
* **Typesetting**: Every successful presentation will be assigned to another member of the class to be typed in LaTeX and submitted for a grade. Thus, each person will be responsible for typing several solutions/proofs over the course of the semester. The instructor will maintain a single document consisting of all typeset solutions and proofs. This will be made available at the end of the semester. Please use the template on the course webpage. Typed solutions/proofs are due one week after the successful presentation.
* **Tests**:There will be 3 tests throughout the semester. The last test will occur during the final exam period.

**Grading**: Presentations 75 points

Homework 50 points

Projects 75 points total

Typesetting 25 points

Tests 75 points total

**Final grade**: This will be calculated by your points earned out of the 300 available. A certain percentage guarantees at least a certain grade (see below).

90% for an A- 80% for a B- 70% for a C- 60% for a D

**A bit about Formal Reasoning**: This course satisfies the Formal Reasoning (FR) requirement of the general education program.  The four category goals are 1) acquaint students with one or more formal reasoning systems, 2) promote understanding of formal reasoning systems and their use in identifying, analyzing, and solving problems, 3) provide a real world context for the use of formal reasoning, and 4) convey an appreciation of formal systems.

In mathematics, one formal reasoning system we use is language itself.  Language as we use it in day-to-day communication is intentionally messy, where the same word or phrase can convey radically different meanings depending on context.  The goal of mathematics is to craft statements that are unambiguous, statements that are either true or false.  We then use the tools of logic to determine which is the case.  Note that while notation can be helpful in crafting precision statements, it is not necessary.  Rather what is necessary is for students to be attentive to what terms mean.  Thus a focus on definitions is essential.

This class will devote a significant amount of time and material to the development of concepts, conjectures, and theorems that lead to the development of a body of mathematical knowledge.  To some nontrivial degree the students themselves must be involved in the development or derivation of these tools.  Merely following a given algorithm or working short problems requiring only basic skills will not qualify as Formal Reasoning.

In Linear Algebra we will study the formal system known as a linear space. This is an abstract mathematical space defined by several properties (or axioms). Linear spaces are very prevalent in the world of mathematics, and not just in the field of linear algebra. Their study is crucial for opening the gates to higher mathematics. We will conduct formal reasoning on this formal system by discovering and proving that linear spaces have various properties.

**Honesty**: You can collaborate with your classmates if you wish, but you cannot use any outside resources to assist with anything you present. If you are ever in doubt, please ask me for clarification.

**Attendance**: Attendance will not be taken.

**Accommodations for Disabilities**: Students who require such considerations should make an appointment with me during the first week of classes.

**Important dates:**

* Last date to drop this course is Friday, February 27th
* Final Exam is Thursday, April 23rd 3:30pm-5:30pm

The instructor reserves the right to make changes to the syllabus. Any changes will be sent via email.

The **goals of this course** (in addition to learning the standard linear algebra content) are as follows: Students will learn how to…

1. do mathematics by actively engaging in this process.
2. clearly and effectively communicate and defend their own logical arguments.
3. tell whether an argument is valid or invalid.
4. write/type proofs and solutions to problems using proper mathematical language, and become proficient with using LaTeX.

The **structure of this course** consists of the following elements:

1. Students will work on the problems in the text outside of class without using any outside resources. You may work with your classmates on problems if you wish, but only one person can present the solution. Make sure to give proper recognition to anyone who helped you.
2. During class, students will present their final solutions of the problems from the text. These presentations are made to the other students, not to the teacher. For each problem, a presentation will be made by a volunteer selected by the facilitator. After each presentation there will be time for open discussion of the presented work. It is the responsibility of the rest of the class to evaluate the validity of the presented work.
3. There will be supplemental projects assigned periodically. These will be done entirely outside of class.

The **ground rules** of this course are the following:

1. You must be respectful when commenting on a classmate’s work. This is the most important part of every discussion.
2. Presentations must be final solutions, and not a work-in-progress. While presenting, you should give a step-by-step explanation, and not explain everything at the end.
3. If a presented argument is determined by the class to be incorrect, then no improvements can be suggested during class. The presenter will have the opportunity to present a solution of that same problem during the next class time. If it is determined to be incorrect a second time, then the problem goes back on the list as an open problem that anyone can present.
4. Each presented problem will be assigned to one member of the class to have it’s final version typed in LaTeX. The final typed version is due one week after the presentation of that problem was given.
5. Using outside resources is considered cheating, and will be treated according to the policies listed in the Student Handbook.

Inquiry-Based Learning (IBL) is a method of teaching mathematics which requires the student to produce results through individual or group exploration of concepts. The instructor serves as a facilitator of student-driven discussions. This technique has been around for thousands of years, even being practiced by Socrates. There are many ways to implement the IBL method into a course. The format of this course is sometimes labeled the “Modified Moore Method”, named after Professor R.L. Moore at the University of Texas at Austin.

Taking an IBL course presents the student with many intellectual benefits over a traditional course. You will learn to think and solve problems independently, as opposed to memorizing a collection of facts presented in lectures. You will learn to be autonomous when analyzing the verity of arguments. This is an indispensable skill which can be employed in any area of life. In this particular course, you will learn to effectively communicate your ideas to others (both written and orally), and gracefully receive criticism of your arguments. You will have the pleasure of the intellectual inquiry which proceeds from our discussions during class. At the end of the course you will also have a document consisting of original work done by you and your classmates. This will be something to be proud of.

I thank the Journal of Inquiry Based Learning in Mathematics (JIBLM) and David Clark for providing the text for this course.