

Math 412 Syllabus

Instructor: Andrew Obus, obusa@math.upenn.edu. (917)-509-5538.

Class Time: MTWR, 1:00-3:10, DRL 3C8. Each class period, from 2:00-2:10 or thereabouts, we will have a break.

Office Hours: DRL 4C21 TR 11:50-12:50, MW 3:10-4:10 (right before class Tuesdays and Thursdays, and right after class Mondays and Wednesdays), or by appointment.

Website: <http://www.math.upenn.edu/~obusa>

Textbook: *Linear Algebra, 3rd ed.* by S. Friedberg, A. Insel, and L. Spence (hereafter referred to as “FIS”). N.B.: Recently, a 4th edition of this book has been published, which is a very minor revision. If you want to get this edition, that’s fine, but problems assigned from the book will be numbered based on the 3rd edition. I will xerox the relevant pages so that those with the 4th edition can do the correct problems. Due to some miscommunications with ordering, this book is not at the bookstore, so please order it on Amazon or from the publisher (Prentice Hall) as soon as possible. Also, there is a different book at the bookstore, by Lay. We will not be using that book for the course.

Goals: There are three major goals for this course. The first goal is for you to learn a great deal of linear algebra, and appreciate (or at least understand) what is going on “behind the scenes.” For instance, have you ever wondered why matrix multiplication is defined the way it is? We will address that and similar questions. The second goal is for you to learn how to construct a correct mathematical proof, and identify some of the pitfalls that can make proofs incorrect or incomplete. The third goal is to give you an appreciation of some of the applications of linear algebra—what does diagonalizing a matrix have to do with the real world?

Topics: We will try to cover most of FIS, omitting certain sections but at least giving a taste of each chapter. Certain expositions and topic orderings may be changed, and we may do some applications from outside the book. The major topics are vector spaces, linear transformations and their relationships to matrices, diagonalization, inner product spaces, various canonical forms, and applications.

Prerequisites: I will assume that you have had a course that is the equivalent of Penn’s Math 240 (or at least the linear algebra part). I don’t expect that everyone actually remembers all the linear algebra from that course, but I will assume knowledge of and comfort with the most elementary topics (adding, subtracting, multiplying matrices and vectors, complex numbers and their basic properties), and at least familiarity, if not comfort, with some of the less basic topics (vector spaces, eigenvectors/values, determinants, Gaussian elimination, diagonalization).

Homework: Assignments will be given twice weekly—a short assignment on Tuesday due that Thursday, and a longer assignment on Thursday due the next Tuesday. The twice weekly homework is meant so that you never go too long without thinking about the subject matter—this course covers a lot of material in a short amount of time, and it is important not to fall

behind. I will grade about half the problems on the homework (the same problems on each person's homework), and I will post solution sets soon after the homework is due. Please check the ungraded problems against the solution set! No homework will be accepted after class on the due date, but I will drop the lowest homework grade. Collaboration is highly encouraged (all of us grad students do it), but you must write up your own homework.

Grading: 40% Homework, 30% Take-home midterm (to be assigned in lieu of a regular homework on 7/14), 30% In-class final (on 8/4, the last day of class).

About Me: I just finished my first year of the Ph.D. program in mathematics at Penn, and, although I have TAed before, I have never had full responsibility for a class. I am sure I will make some mistakes over the course of the semester. PLEASE correct me in lecture if you think I have made a mistake (you might see it, but many of your fellow students will not, and will have incorrect notes unless you speak up). Also, I may misjudge the appropriate pace of lectures or length of homework. If you feel this is systematically happening, please bring it to my attention.

Final Note: I will be in Israel from 6/22 to 7/3, and David Favero (favero@math.upenn.edu) will be giving the first week of lectures. I will try to respond to some email during this time, but my access will be sporadic at best.