SYLLABUS – MATH 2568 (LINEAR ALGEBRA) – FALL 2016

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office hours: Mondays 9:45-11:15 and Tuesdays 10:00-11:30 in MW 630 (Math Tower)

sections:

35: Scott Lab E40, 11:30-12:25

90: Scott Lab N50, 1:50-2:45

110: Jennings Hall 40, 3:00-3:55

textbook: *Introduction to Linear Algebra*, by Johnson, Riess, & Arnold (5^{th} edition).

course website: http://math.berkeley.edu/∼aaron/teaching/f16/

overview: Linear algebra is the study of systems of linear equations and their solutions. It is both fascinating and widely applicable. On the one hand, it affords glimpses of some very beautiful advanced mathematics, which we will come to appreciate as the course progresses. On the other hand, it is of crucial use throughout the natural and social sciences, and even figures heavily into such everyday tools as Google's search results and Netflix's movie recommendations.

This class focuses on the fundamental concepts of linear algebra. Specifically, systems of linear equations can be efficiently organized using certain mathematical entities called ***matrices*** (the plural of "matrix"), and so we will study them as well as various concepts to which they lead. A more detailed outline of the course is as follows.

(1) *systems of linear equations and matrices (chapter 1):* We recall the notion of a system of linear equations, and we introduce matrices as a means of organizing and solving them.

(2) *vectors in two and three dimensions (chapter 2):* When viewing systems of linear equations through the lens of matrices, their solutions are called ***vectors***. We shift focus from matrices to vectors, and use physical intuition to study vectors in the plane and in 3-dimensional space.

(3) *abstract vector spaces and linear transformations (chapters 3 and 5):* Many different mathematical objects can be considered as vectors, albeit in a more abstract sense, and these themselves organize into ***vector spaces***. We first generalize our intuition from 2- and 3-dimensional vector spaces to n-dimensional vectors. Then, we use this understanding to study abstract vector spaces, and we also study the ***linear transformations*** which relate them.

(4) *determinants and the eigenvalue problem (chapters 4 and 6):* The ***eigenvalue problem*** is a fundamental problem in matrix theory, which is useful not just for solving systems of linear equations but also for many more advanced applications. This problem is intimately related to the ***determinant*** of a matrix, and so in studying the eigenvalue problem we will also learn techniques for computing determinants.

(5) *applications (chapter 7 and/or supplementary materials):* If time permits, we will see some applications of the theory we have developed over the course of the semester.

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last updated: September 14, 2016.

grades: In this course, grades will be based on three components: weekly quizzes (collectively worth 20%), two midterms (each worth 20%), and the final exam (worth 40%). In addition, you will be assigned optional homework (available on the course website) to help you prepare for the quizzes and exams.

- *quizzes:* Quizzes will be given at the beginning of class every Wednesday, starting on Aug. 31 and excluding the two midterm days (see below). So, there will be twelve quizzes. Your lowest two quiz grades will be dropped, and the rest will be weighted equally. This is to handle emergencies and other unforeseen circumstances: there are no make-up quizzes, and instead such an instance will simply count as a dropped quiz grade.

  The quizzes will be closely based on the homework problems. So, the best way to prepare for them will be to do the homework. You are encouraged to work in groups, but you should be honest with yourself: being able to nod along when the solution is told to you is not the same as being able to solve the problem yourself. The quizzes will be based on the material covered during the previous week.

- *midterms:* There will be in-class midterms on Wednesdays Sept. 28 and Nov. 2. The second midterm will emphasize the material not covered on the first midterm.

- *final exam:* The final exam will be cumulative, but will emphasize the material not covered on either midterm. The schedule is as follows:
  - section 35: Dec. 15, 10:00-11:45;
  - section 90: Dec. 14, 2:00-3:45;
  - section 110: Dec. 9, 12:00-1:45.

learning management system: In addition to the course website listed above, we will also use Carmen, though the precise nature of our usage may change with time. For one, it will be used to distribute grades for quizzes and midterms. But also, hopefully you all will keep its discussion forums active; both asking and answering questions are important parts of the learning process. (I will happily chime in there when requested.)

general schedule: As stated above, quizzes will be given at the beginning of the class on Wednesdays. After the quiz, I'll give an overview lecture that summarizes the next week's material, and I'll assign reading from the textbook. Our meetings on the following Friday and Monday will be much more informal, and will be dedicated to developing intuition and honing problem-solving techniques.

academic integrity: You must abide by the university policies on academic misconduct. You can see the entire code of conduct at `studentaffairs.osu.edu/csc/`. Of particular relevance is part A ("Academic misconduct") of section 3335-23-04 ("Prohibited conduct"). In essence, it requires you to be honest. So, please: be honest.