Math 312: Linear Algebra

Spring 2019 Syllabus

Instructor: Eduardo García-Juárez
Email: edugar@math.upenn.edu
Lectures: Tuesday-Thursday 10:30-12am in David Rittenhouse Lab. A2.
Office hours: M 12:30-2:30pm (or appointment by email) in DRL 3N4C.
Course Web Page: Canvas

Grader: Artur Bicalho-Saturnino (bsatur@math.upenn.edu)

Prerequisites: Math 240 or its equivalent. You are expected to be comfortable with integrating and differentiating functions as well as the basic concepts of multivariate geometry, e.g. vectors vs. scalars, equations defining lines and planes, parameterized paths and so on. We will review matrix operations such as addition and multiplication but it is assumed that you have seen these before.

Course Overview: Linear algebra begins with solving an old problem: how can I find a solution to a system of linear equations? A key insight is that the techniques used to solve linear systems apply to a much broader class of problems. This course will cover the techniques used to solve linear equations, build off these techniques to deal with more complex problems, and discuss real-world applications such as Markov chains and Google's PageRank algorithm, the use of singular value decomposition in image processing and principal component analysis, linear optimization, etc.

Topics to be covered: (conditional on time constraints and subject to change)

- Solving Linear Equations
- Vector Spaces and Subspaces
- Linear Transformations
- Orthogonality
- Determinants
- Eigenvalues and Eigenvectors
- Various Applications

Textbook: We will be using an online book, zyBook: Linear Algebra. Instructions to subscribe:
- Sign in or create an account at `learn.zybooks.com`
- Enter zyBook code: UPENNMATH312Spring2019
- Subscribe within the first two weeks (A subscription is $58. Subscriptions will last until May 27, 2019.)

Canvas: The class will make use of Canvas to post assignments, grades, announcements, etc. Students will be responsible for checking Canvas regularly during the semester.

Homework: Weekly, posted on the Canvas website. Homework will be assigned on Wednesdays (starting on the first week), and it will be due the following Wednesday at 4pm on Canvas (a scanned copy; you can use for example the app CamScanner). You will be allowed one week to complete each assignment. Collaboration between students is encouraged, but you must write your own solutions, understand them, and list the names of your collaborators at the top of each assignment.

Late homework will not be accepted.

Your two lowest homework scores will be dropped.

Participation: Your participation grade will be based on completion of the reading each week and answering the participation questions in the zyBook.

Attendance and Course Notes: It is in your best interest to attend each lecture and take accurate notes. You will be tested on the material **as it is covered in class**. If you miss a lecture, make sure that you copy from a classmate and review the notes from that day.

Exams: There will be two in-class midterms and a final exam. Exam attendance is *mandatory*; please make sure you can attend the exams *before* enrolling in the course. You can take the make-up midterm only if you have a medical excuse or *prior* arrangement (you must inform me at least 24 hours prior). The final exam will be cumulative.

The first exam is on February 14. **Before drop deadline.**

The second exam is on April 2. **Before withdraw deadline.**

The final exam is on May 9, 12-2pm.

First class, last class: January 17, April 30.

Evaluation: Your final grade is based on the homework (5% participation activities in zyBook, 5% challenge problems from zyBook included in Homework sets, 15% rest of homework), the midterms (25% each), and the final exam (25%).

Extra resources:

- "Introduction to Linear Algebra" by Gilbert Strang (4th or 5th Ed.)
- **Math Help** is available Monday through Thursday 4PM to 7PM in Education Commons 235. No appointment is necessary. This is a great place to work together on homework, with extra assistance available if need be (`https://www.math.upenn.edu/undergraduate/calculus-homepages/schedule-math-centers`).
- **CAPS**: Counseling & Psychological Services (`https://www.vpul.upenn.edu/caps/`) This is an excellent resource, not sufficiently known, that everybody should use whenever stress or any other personal issues arise.
- **The Tutoring Center** `www.vpul.upenn.edu/tutoring/`
- **Math Department Approved Private Tutors** `www.math.upenn.edu/ugrad/tutors.html`
- **MIT Open Courseware** Professor Gilbert Strang has lectures for an entire course taught from his book available online. He has many resources available: videos and transcripts of lectures and recitations, problem sets with solutions, and exams. It's all available at `ocw.mit.edu` in courses 18.06 and 18.06 SC.
- **Khan Academy** the videos here are more techniques oriented than theory oriented, and some of our more advanced topics aren't covered, but Khan Academy is still a great resource for large parts of this class. `www.khanacademy.org/math/linear-algebra`
- **Wikibooks** The Linear Algebra textbook on Wikibooks is fairly comprehensive and includes a large collection of examples and practice problems with in-depth solutions. `en.wikibooks.org/wiki/Linear_Algebra`