Math 312: Linear Algebra

Fall 2018 Syllabus

Instructor: Eduardo García-Juárez
Email: edugar@math.upenn.edu
Course Website: Canvas (or https://egarciajuarez.com/teaching/)
Lectures: Tuesday-Thursday 1:30-3 pm, in LRSM Auditorium
Office Hours: M 12:30-2:30 pm (or appointment by email) in DRL 3N4C

Grader: Toshitha Kannan (`toshitha@seas.upenn.edu`).

First class, last class: August 28, December 6.

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 Google's PageRank algorithm, principal component analysis, and the use of the singular value decomposition in robotics.

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

- Solving Linear Equations (Strang Chapter 2)
- Vector Spaces and Subspaces (Strang Chapter 3)
- Orthogonality (Strang Chapter 4)
- Determinants (Strang Chapter 5)
- Eigenvalues and Eigenvectors (Strang Chapter 6)
- Linear Transformations (Strang Chapter 8)
- Various Applications (Strang Chapter 7, 10, etc.)

Textbook: "Introduction to Linear Algebra" by Gilbert Strang (5th Ed).

Evaluation: There will be Homework, two Midterm exams and a Final exam. Each of these four components counts 25% of the final grade.

Homework: Weekly, posted on the courses Canvas website. Homework will be assigned on Wednesdays (starting on first week), and it will be due the following Wednesday at 4pm in your grader's mailbox (secretary of DRL building, 4th floor). 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.

Exams: There will be two in-class midterms and a final exam (which is cumulative). Exam attendance is *mandatory*, please make sure you can attend the exams *before* enrolling 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 first exam is on Tuesday, Oct. 2. **Before drop deadline.**

The second exam is on Tuesday, Nov. 6. **Before withdraw deadline.**

The Final exam is on Wednesday, Dec. 19, 9-11 am.

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. Requesting Canvas help can be done by email `canvas@pobox.upenn.edu`

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**.

Extra resources:

- **Math Help** M-T from 4PM to 7PM in room 235 of the Education Commons. 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/getting-help/calculus-help`
- **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 - author of the text for this course - has lectures for an entire course taught from this 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 `www.ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/`.
- **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`

Disabilities: Any student who requires special accommodation should contact the Office of Student Disabilities Services (SDS) at the Weingarten Learning Resources Center. For more information, see `www.vpul.upenn.edu/lrc/sds`.