LINEAR ALGEBRA (MATH 2250)

Dates: May 19 - June 27, 2025

Location: Asynchronous

Students will participate in the course using Georgetown University's online learning management system called Canvas. All course materials will be linked in the Canvas course.

Professor: Zhe Liu

Professor Contact Information: zl602@georgetown.edu

Office Hours: TBA

COURSE DESCRIPTION

This course presents the basic theory and methods of finite dimensional vector spaces and linear transformations on them. Topics include: matrices and systems of linear equations; vector spaces, bases, and dimension; linear transformations, kernel, image, matrix representation; inner product and orthogonality; determinants, inverse matrices; eigenvalues, eigenvectors, diagonalization of matrices, etc.

COURSE LEARNING OBJECTIVES

For the General Curriculum, at the successful completion of this course, the student will demonstrate the following student learning outcomes: mathematical communication skills, quantitative reasoning skills, and critical thinking and problem-solving skills. Specifically, at the successful completion of MATH-2250, students will be able to:

- Solve systems of linear equations: Perform matrix algebra, apply Gaussian elimination, analyze the resulting matrix and describe the solution set.
- Understand the definition and basic properties of determinants, and apply them to compute determinants. Use Cramer's Rule to solve certain systems of linear equations.
- State, understand, and apply key definitions and theorems, including: vector spaces, subspaces, linear independence, basis, dimension, linear transformations and the corresponding matrix representations, inner product and orthogonality of vectors, the Invertible Matrix Theorem, the Rank Theorem, etc.
- Find the eigenvalues and corresponding eigenvectors of a matrix/linear transformation.
- Determine whether a matrix is diagonalizable. Diagonalize certain matrices.
- Apply the Gram-Schmidt Process.

COURSE SCHEME

Homework	20%
Quizzes	20%
Exam 1	20%
Exam 2	20%
Exam 3	20%

	A 93-100%	A- 90-92%
B+ 87-89%	B 83-86%	B- 80-82%
C+ 77-79%	C 73-76%	C- 70-72%
D+ 67-69%	D 60-66%	F Below 60%

COURSE ASSIGNMENTS

Homework: Homework assignments will be completed via MyLab Math online (through Canvas). Problems assigned will consist of routine exercises as well as problems that push you to think about and work with the underlying concepts at a deeper level. Your lowest homework score will be dropped.

Quizzes: After 2-3 homework assignments, there will be a quiz taken via Gradescope (through Canvas) based on the material covered in these assignments. Each quiz will consist of 2-3 free-response questions, and it will be available on Gradescope with a 40-minute time limit. There will be no makeup quizzes. Your lowest quiz score will be dropped.

Exams: There will be three exams taken via Gradescope. These tests will cover the material from the previous 1.5-2 weeks. Makeup exams will be given only under extraordinary circumstances (e.g. medical emergency). Written requests must be made as early as possible with supporting documentation provided.

COURSE SCHEDULE

MODULE 1 (week 1): Systems of Linear Equations (part I)

MODULE 2 (week 2): Systems of Linear Equations (part II)

MODULE 3 (week 3): Matrix Operations; Determinants

MODULE 4 (week 4): Vector Spaces

MODULE 5 (week 5): Eigenvalues and Eigenvectors

MODULE 6 (week 6): Orthogonality

INFORMATION ABOUT TOOLS AND TECHNICAL REQUIREMENTS

- You will need access to a computer (Windows or Mac) or a tablet and adequate Internet service to complete this course. Although you can use other devices such as smartphones to access course documents in Canvas, please note that some tools, such as Proctorio, do not work on smartphones.
- You will need access to a printer to print out quizzes and tests or a device (e.g. tablets) that you can directly write on the quizzes and tests downloaded from Canvas.
- You will need an PDF scanner App (e.g. Genius Scan) to scan your written physical pages to a single PDF file or an App (e.g. Goodnotes) that can save your written pages on tablets to a single PDF file.
- The minimum requirements needed to use Canvas can be found in this Canvas guide.

COURSE POLICIES AND EXPECTATIONS

Participation and Workload: Regular participation is essential to your success in this class. Our remote learning courses are designed to meet the same academic standards as our place-based (face-to-face) courses. You are expected to complete all readings, module assignments, Tests, and activities on time. Students should plan on spending approximately 9-12 hours a week on readings, assignments, quizzes, etc. in addition to the 3-4 hours of instructional time.

Other important reminders: It is important that you set up Notifications on Canvas to receive all course announcements and due date changes.

SEEKING HELP

Office Hours: Office hours is one of the most useful resources available to students. Using office hours effectively benefits students in multiple ways, from clarifying course content to receiving general academic advising. Throughout the summer session, I will hold multiple office hours each week (no appointment needed). Additional office hours are available by request.

Email Communication: Please feel free to email me with your questions, concerns, and/or to schedule a time to meet (over Zoom). Please use either Georgetown email or Canvas email system.

ACCOMMODATIONS

Georgetown University is committed to showing care and concern for each student by creating an inclusive and accessible learning environment to meet the needs of its diverse student body. Please feel free to contact the Academic Resource Center for more information and resources regarding academic support and accommodations (https://academicsupport.georgetown.edu). Any information you provide will be treated as private and confidential.

ACADEMIC INTEGRITY

All students will be required to make the Georgetown University Honor Pledge: *In pursuit of the high ideals and rigorous standards of academic life, I commit myself to respect and to uphold the Georgetown University honor system: to be honest in every academic endeavor, and to conduct myself honorably, as a responsible member of the Georgetown community as we live and work together.* All students are expected to follow Georgetown's honor code unconditionally. If you have not done so, please read the honor code material located online at the Honor Council website: https://honorcouncil.georgetown.edu. Students are expected to work with integrity and honesty in all their assignments. Cheating on a test or quiz will result in your receiving a grade of zero on the test or quiz. Repeated cheating will result in your failing the course.

SUPPORT SERVICES

Title IX at GU: Title IX of the Education Amendments of 1972 ("Title IX") prohibits discrimination based on sex in any educational programs, which includes sexual harassment or any acts of sexual misconduct. Title IX requires the University, upon becoming aware of any incident of sexual harassment and misconduct to respond appropriately to protect and maintain the safety of the University community, including students, faculty, and staff. Please visit Title IX at Georgetown University https://titleix.georgetown.edu for more information.

Technical Support: All students have access to Canvas technical support 24 hours a day, 7 days a week, including live chat and a support hotline. Use the 'Help' icon in the lower left of your Canvas window to view all available support and feedback options. If you're looking for help on a specific feature, check out the Canvas Student Guide.

eResources: Students enrolled in courses have access to the University Library System's eResources. You can access these resources through the Library's Homepage by using your NetID and password.

More Support Services: Georgetown University offers a variety of support services for students. Below are some additional resources available to you:

- University Information Services (UIS) https://uis.georgetown.edu
- Division of Student Affairs https://studentaffairs.georgetown.edu
- Student Health Services https://studenthealth.georgetown.edu