

MATH:2700:0091 Introduction to Linear Algebra

Spring 2024 - Syllabus

Time and Location: 9:30–10:20 AM Monday, Tuesday, Wednesday, Thursday in 14 Schaeffer Hall (SH)

Instructor: Ibrahim Emirahmetoglu

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Office Hours: 10:30–11:30 AM Monday, Tuesday, Wednesday, Thursday; and by appointment

Administrative Home: [The College of Liberal Arts and Sciences \(CLAS\)](#), 120 SH

Academic Home: [Department of Mathematics](#), 14 MLH

Course Supervisor: Dr. Xiaoyi Zhang, xiaoyi-zhang@uiowa.edu, 25E MLH

Department Chair (DEO): Dr. Ryan Kinser, ryan-kinser@uiowa.edu, 14A MLH

Course Website: To access the course website, log on to [ICON](#) using your HawkID and password.

Course Description: This course presents the fundamental concepts, methods, and techniques of linear algebra. Topics include the solution of systems of linear equations, matrices, reduction to row echelon form, rank, nullity, determinants, vectors in n -dimensional Euclidean space, general vector spaces, dimension, linear transformations, change of basis, eigenvalues and eigenvectors, diagonalization, symmetric matrices.

Linear algebra is important for two fundamental reasons: (i) Linear equations are essentially the only equations that can be solved, especially when more than one variable is involved. A large portion of applied mathematics is devoted to transforming non-linear problems into linear equations that can be solved. (ii) Linear algebra is a gateway to modern mathematics. The key concepts of linear algebra are matrices and matrix algebra. Matrices are used for solutions of linear equations, the study of properties of linear transformations, the description of various vector spaces, etc. In the course, we will discuss the geometry of Euclidean spaces, eigenvalues and eigenvectors, diagonalization of matrices, orthogonal diagonalization of symmetric matrices, and many other fundamental notions.

Course Objectives: After successfully completing the course, you will have a good understanding of the following topics and their applications:

- Systems of linear equations
- Row reduction and echelon forms
- Matrix operations, including inverses
- Linear dependence and independence
- Subspaces, bases, and dimensions
- Orthogonal bases and orthogonal projections
- Gram-Schmidt process
- Linear models and least-squares problems
- Determinants and their properties
- Cramer's Rule
- Eigenvalues and eigenvectors
- Diagonalization of matrices
- Symmetric and positive definite matrices
- Similar matrices
- Linear transformations
- Singular Value Decomposition

Textbook: *Linear Algebra And Its Applications*, David C. Lay, Steven R. Lay, Judi J. McDonald; Pearson, 6th edition, 2020. ISBN: 9780135851203

Prerequisites: MATH:1850 or MATH:1550 or MATH:1860 or MATH:1560

Grading System: Letter grades with +/- will be used. For the letter grades, an aggregate score of at least 90% (resp. 80%, 70%) guarantees a grade that is at least A- (resp. B-, C-). Typically, however, the thresholds for these grades turn out to be somewhat lower – for example, 87%, 75%, and 65%. The eventual thresholds will be determined by the instructor based on the difficulty of the assignments and exams. As noted on the CLAS teaching policy page, the grade of A+ is a rare grade, assigned only in the case of exceptional work.

Coursework and Grading: Coursework will consist of the following:

- **Quizzes (10%):** There will be weekly quizzes at the end of class each Thursday. A typical quiz consists of a short problem taken from the topics covered in that week. They are mostly for attendance purposes.
- **Homeworks (20%):** There will be weekly homeworks posted on ICON, and you will turn in your solutions in class. You will have at least a week to complete each homework. You are allowed to collaborate on the homeworks with your classmates, but the final write-up must be your own.
- **Midterm exams (40%):** There will be two –open notes/books– midterm exams, each worth 20%.
- **Final exam (30%):** The final exam will also be open notes/books.

Exam Dates: The exam dates are given below. You have two weeks to request a change if exam conflicts exist or if you have more than two exams in one day.

- (1) The first midterm is during class on **Wednesday, February 21**.
- (2) The second midterm is during class on **Wednesday, April 3**.
- (3) The final exam will be during the finals week. The date, time, and place are announced in the fifth week of the semester by the Registrar's office.

Late Assignments: All assignments are expected on time. You may turn in an assignment late, but you will receive a 10% deduction for each 24-hour period that it is late, including the first 24-hour period. For example, if Assignment X is due at 11:30 AM on Tuesday, and you submit the assignment at 11:31 AM on Tuesday, then you will lose 10%; if you submit Assignment X on Wednesday after 11:30 AM, then you will lose 20%; etc.

Collegiate and University Policies and Guidelines: The administrative home of this course is the College of Liberal Arts and Sciences, which governs academic matters relating to the course such as the add/drop deadlines, the second-grade-only option, issues concerning academic misconduct, and how credits are applied for various graduation requirements. Different colleges might have different policies.

The College of Liberal Arts and Sciences is committed to providing students with a diverse, equitable, and inclusive environment in which to pursue their educations. In addition, all students in CLAS courses are expected to abide by [the CLAS Code of Academic Honesty](#). Undergraduate academic misconduct must be reported by instructors to CLAS according to [these procedures](#). Student concerns about this class or your performance in it can be discussed with [the instructor](#) and/or [the course supervisor](#), and finally with [the department chair](#). Students should contact [CLAS Undergraduate Programs](#) for support when the matter is not resolved at the previous level.

The University of Iowa is committed to [the protection of freedom of speech and the principles of academic and artistic freedom](#), to [accommodating students with disabilities](#), and to [accommodating absences due to religious holidays and military service obligations](#). In addition, students are expected to comply with [the University's Code of Student Life](#). The University is also committed to [non-discrimination](#) and [prohibits all forms of sexual harassment, sexual misconduct, and related retaliation](#). The University also provides [resources for student mental health](#) as well as for [the basic needs and support of students](#). More information about these and other policies can be found on [the Provost's Office's website](#).