Math 229 - 01 Applied Linear Algebra Fall 2026 Syllabus

Instructor : Richard Bartels, PhD

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Office Hours: MWF 9:50-10:50 am and 12:00-1:00 pm
or by appointment (email to set up)

Lecture : MWF 11:00 - 11:50 am, classroom TBA

Textbook : *Linear Algebra and its Applications* (5^{th} edition) by David C. Lay et al.

Note: You do not need to purchase the textbook-I will post a digital version of the textbook on the class Moodle page.

Purpose and Objectives (Theory): Linear algebra begins with vector algebra in $\mathbb{R}^3$. This theory extends to n-dimensional Euclidean space $\mathbb{R}^n$, and in this context, we solve simultaneous systems of linear equations (linear systems) by considering them as matrix equations of the form $A\mathbf{x} = \mathbf{b}$. Here our path divides-we develop the theory of matrix algebra, and then of normed vector spaces. These paths connect in our study of eigenvalues and eigenvectors of linear transformations of vector spaces. At the end of the course, we use the theory we have developed to find the least-squares solution to inconsistent linear systems, and the singular value decomposition for non-diagonalizable matrices.

Purpose and Objectives (Applications): Throughout this course, we will use linear algebra to develop methods for modeling and solving geometric and real-world problems, including the following:

- Model the exchange of goods between sectors in an economy with linear systems, and solve them to determine the equilibrium prices for each sector.
- Balance chemical equations and model network flow.
- Study the geometry of linear transformations of the plane, including rotations, reflections, and scaling of points in $\mathbb{R}^2$. This theory generalizes to $\mathbb{R}^3$.
- Use eigenvalues and eigenvectors to solve systems of first-order linear differential equations.
- Use eigenvalues and eigenvectors to study the evolution of discrete dynamical systems.

MATLAB: You can use MATLAB to help with homework computations. However, MATLAB is not required for any of the graded components of the course. You can access MATLAB on any public computer on campus, or through Trinity's virtual desktop. Here is a link to instructions for using the virtual desktop: `https://www.trincoll.edu/lits/technology/software/windows-virtual-desktop-software/` For exams, you will have to know how to do computations on your own.

Grading : Your final letter grade for the course will be determined from your numerical percentage grade in the following way: (..., B 83-86, B^+ 87-89, A^- 90-92,...). Here is how your grade is determined.

Attendance/Participation :	5%
Homework :	20%
2 Midterm Exams :	45%
Final Exam :	30%

- The final exam is Monday, December 21st, 12:00-2:30pm.
- Do not make arrangements to leave for break before the final exam date.

Important Dates :

Tues, Sep 15	• Add/Drop period ends • Last day to declare a class Pass/Low Pass/Fail
Nov 2 – 6	• Advising Week
Wed, Nov 11	• Withdraw deadline for Fall semester courses
Mon, Dec 14	• Last day of classes
Dec 17 - 23	• Final exam period
Mon, Dec 21	• Final exam

Please read and sign the following declaration regarding academic integrity:

In accordance with Article II of the Trinity College Student Integrity Contract, I hereby pledge that the papers, exams, and other academic exercises I submit for this course will represent my own work; that I will properly acknowledge and attribute any and all information and ideas that I have used from other sources; and that no collaboration unauthorized by the instructor of the course will occur in the course of its completion.

Signature: _____ Date: _____

Office Hours : You are encouraged to come to office hours whenever you have questions about course material, including questions about homework and exam problems. If you are unable to make the regularly scheduled office hours, please email me to determine a different time to meet.

Exams : There will be two in-class exams (see the schedule below) and one cumulative final exam which is scheduled by the registrars office for **Friday December 12, 12:00 - 2:30pm. Do not make arrangements to leave for break before the final exam date.**

Homework : I will assign written homeworks throughout the course. Each homework will cover about five sections of the textbook. You will be graded on your work and answers to homework problems. You are allows to work on homework together, or get help from the TUtoring Center, but you must write and submit your own solution to each homework assignment.

Tutoring: Drop-in tutoring is available in the Math Tutoring Center (Q-Center), located in MECC 172, Monday through Thursday 4-10pm and Sunday 7-10pm. The schedule and instructions to access tutoring will be made available in the second week of classes and linked from Moodle as well as at the webpage `https://www.trincoll.edu/quantitative-center/tutoring-support/`

Students with Accommodations : Trinity College is committed to creating an inclusive and accessible learning environment consistent with the Americans with Disabilities Act. Students with disabilities who may need some accommodation in order to fully participate in this class are urged to contact the Student Accessibility Resource Center, as soon as possible, to explore what arrangements need to be made to assure access.

If you have approval for academic accommodations, please notify me by the end of week two of classes. For those students with accommodations approved after the start of the semester, a minimum of 10 days' notice is required. Please be sure to meet with me privately to discuss implementation.

Student Accessibility Resources can be reached by emailing SARC@trincoll.edu

Academic Integrity : In accordance with the Trinity College Student Integrity Contract, students are expected to abide by the highest standards of intellectual honesty in all academic exercises. Intellectual honesty assumes that student do their own work and that they credit properly those upon whose work and thought they draw. It is the responsibility of each student to make sure that they are fully aware of what constitutes intellectually honest work in every exam, quiz, homework, or other academic exercise submitted for evaluation in a course at Trinity College.

Course Policies :

- **Low Exam Policy:** If your grade on the final exam is better than the grade on your lowest midterm exam, your final exam grade will replace your lowest midterm exam grade. **Note:** you must take both midterm exams.

- **Calculator Policy:** You may use a scientific or simple function calculator on exams, but not a graphing calculator. You may use any calculator during class, but not any other electronic devices, except for note taking.

- **Use of Moodle:** On Moodle I will post lecture notes, homework assignments, worksheets, solutions to homework, worksheets, and exams, and review packets. Please make sure you are able to access the Moodle site and bookmark it.

- **Use of Email:** I will use trincoll email to make announcements. Please make sure that your Trinity email account is working and check regularly for announcements.

Tentative Weekly Schedule :

Monday	Wednesday	Friday
9/7 - Labor Day (no class)	9/9 - Syllabus, section 1.1: systems of linear equations	9/11 - section 1.2: row reduction and echelon forms
9/14 - 1.3: vector equations	9/16 - 1.4: matrix equation $A\mathbf{x} = \mathbf{b}$	9/18 - 1.5: solution sets of linear systems
9/21 - 1.6: apps. of linear systems, 1.7: linear independence	9/23 - 1.7: linear independence, 1.8: intro to linear transformations	9/25 - 1.8: intro to linear transformations, 1.9: matrix of linear transformation
9/28 - 1.9: matrix of linear transformation 2.1 - matrix operations	9/30 - 2.1: matrix operations 2.2: inverse of a matrix	10/2 - 2.2: inverse of a matrix 2.3: invertible matrix theorem
10/5 - 2.5: matrix factorizations	10/7 - Review	**10/9 - Exam 1**
10/12 - Trinity Days	10/14 - subspaces of $\mathbb{R}^n$	10/16 - 2.9: dimension and rank
10/19 - 3.1: Intro to determinants 3.2: Props. of determinants	10/21 - 4.1: vector spaces and vector subspaces	10/23 - 4.2: null and column spaces 4.3: bases
10/26 - 4.4: coordinate systems 4.5: dimension of a v.s.	10/28 - 4.6: rank 4.7: change of basis	10/30 - 5.1: eigenvalues, eigenvectors
11/2 - 5.2: characteristic equation	11/4 - 5.3: diagonalization	11/6 - 5.4: eigenvectors and linear transformations
11/9 - 6.1: orthogonality	11/11 - 6.2: orthogonal sets	11/13 - 6.3: orthogonal projections
11/16 - 6.4: Gram-Schmidt process	11/18 - Review	11/20 - **Exam 2**
11/23 - 6.5: Gram-Schmidt process	**11/25 - Thanksgiving break**	**11/27 - Thanksgiving break**
11/30 - 6.6: least squares problems	12/2 - 6.6: least squares problems	12/4 - 7.4: singular value decomp.
12/7 - 7.4: singular value decomp.	12/9 - buffer day	12/11 - buffer day
12/14 - Review	**12/21 (Monday) Final exam, 12-2:30 pm**	

The content, policies, assignments, and schedule listed in this syllabus are subject to change. I will announce any changes in class and via email.