

Linear Algebra I (CRN: 9316/7191)
Spring 2023
MATH 322.01/502.01 (4 credits), M_F 01:00P-01:50P, Tu_Th 01:10P-02:00P
Wickersham 101

Description: A rigorous introduction to linear algebra. Includes systems of linear equations, matrix algebra, determinants, vector spaces, inner product spaces geometry in \mathbb{R}^n , linear transformations, orthogonal transformations, eigentheory and diagonalization.

Prerequisite: A grade of C- or better in MATH 311 (*Calculus III*) is the prerequisite for this course. This course may also be taken concurrently with MATH 311. MATH 310 (*Introduction to Proofs*) is recommended as well.

Credit will not be given for this course and MATH 304. MATH 322 is intended for mathematics majors and is more theory and proof-based. MATH 304 is more application oriented and intended for computer science or data science majors.

Instructor: Dr. Buchanan

Office: Wickersham 203-1, Phone: 871-7305, FAX: 871-7948

Office Hours: 11:00A–12:00N (MTuWThF), or by appointment

Email: Robert.Buchanan@millersville.edu (**preferred**)

Textbook: *Linear Algebra*, 4th edition, Jim Hefferon, [free PDF](#), 2020.

PDF copies of this textbook are available online and within our D2L course shell.

Objectives:

- Learn the basic algorithms for matrix computation.
- Understand the solution theory for systems of linear equations, and its connection with matrix algebra.
- Learn about the major structures and techniques of linear algebra, such as determinants, inner products, and eigenvectors.
- Learn about abstract vector spaces and linear transformations.
- Improve ability to read and compose proofs in abstract mathematical symbolism in the context of a specific area of mathematics.

Topic Coverage:

- Systems of Linear Equations and Matrices
- Determinants
- Euclidean Vector Spaces
- General Vector Spaces
- Inner Product Spaces
- Eigenvalues, Eigenvectors
- Linear Transformations

Other topics may be covered as time or interest permit.

The topic of “Vectors in 2-space and 3-space,” will not be covered since that material is part of MATH 311 (*Calculus 3*). Students should review this material on their own as necessary.

Americans with Disability Act: If you have a disability that requires accommodations under the Americans with Disabilities Act, please present your letter of accommodations and meet with me as soon as possible so that I can support your success in an informed manner. Accommodations cannot be granted retroactively. If you would like to know more about the Millersville University Office of Learning Services-please contact the office at 717-871-5554).

Attendance: Students are expected to attend all class meetings. If you must be absent from class on the day that an assignment is due, you must complete and submit the assignment prior to the absence. If you know you will be absent on the day of a test, you must notify me before the time the test is scheduled in order to schedule a make-up test. Students who miss a test should provide a valid excuse, otherwise you will not be allowed to make up the test. No final exam exemptions.

Merely attending class will not earn you a passing grade. Regular class attendance (see [Class Attendance Policy](#)) includes being on time to class and actively engaging and participating in classroom activities. It does not include texting, listening to music, watching videos, browsing the internet, playing video games, checking email, *etc.* Students engaging in these types of activities may be asked to leave the classroom and/or be counted absent for the class meeting. Do not expect a warning or announcement before these sanctions.

Homework: Students are expected to do their homework and participate in class by, among other things, asking questions of the instructor about linear algebra concepts and processes and answering questions posed by student peers during class and in online discussions. Some homework exercises will be assigned from the textbooks while others will be composed by the instructor and distributed electronically to the students. Students will submit their assignments by neatly writing their work on 8.5×11 -inch paper (standard letter size) and handing it to the instructor at the beginning of on the due date. **Late homework will not be accepted.**

Students should expect to spend a *minimum* of twelve hours per week reviewing notes taken during class and working assigned homework exercises. Preparation for the tests and final exam will require additional hours of study. Students will find it beneficial to review all lecture notes and other relevant material collected from the beginning of the semester until the present time at least once per week.

Tests: There will be three in-class tests and a comprehensive final examination. The tests and the final exam will also be distributed electronically to the students and collected by scanning and uploading to a dropbox under D2L. The tests are tentatively scheduled for

1. Thursday, February 16, 2023
2. Tuesday, March 14, 2023 (π Day!)
3. Tuesday, April 11, 2023

The final exam is scheduled for Thursday, May 3, 2023, 10:15A–12:15P. I will not “curve” test or exam grades.

Students who engage in academically dishonest behavior on a test or final examination will receive a grade of 0 for the assessment activity.

Grades: Course grade will be calculated as follows.

Tests	50%
Exam	25%
Homework	25%

Tests and the final examination will be graded individually on a 100-point scale. If a student believes that an error was made in the grading of an assignment or test, the student should explain *in writing* why they believe an error exists and submit the graded material and the explanation of the possible

error to me within 3 class periods of the graded test or homework being returned to the student. In no cases will adjustments to grades of less than 3 points be made. I keep a record of students' test and exam scores. Students should also keep a record of graded assignments, tests, and other materials. As an example of the calculation of the numerical course grade, suppose a student's three test grades were 87, 78, and 60 (out of a maximum of 100 points on each test), the student's final examination grade was 71 (again, out of a maximum of 100). Suppose seven homework assignment were collected and the student's grades were 32/40, 38/50, 50/60, 20/40, 27/50, 40/40, and 23/40. This hypothetical student's numerical course grade would be calculated according to the formula

$$\begin{aligned} \frac{87 + 78 + 60}{3} \cdot 0.50 + 71 \cdot 0.25 + \frac{32/40 + 38/50 + 50/60 + 20/40 + 27/50 + 40/40 + 23/40}{7} \cdot 25 \\ = 37.5 + 17.75 + 17.89 \\ = 73.14 \end{aligned}$$

The course letter grades will be calculated as follows. I will not "curve" course grades.

90-92	A-	93-100	A		
80-82	B-	83-86	B	87-89	B+
70-72	C-	73-76	C	77-79	C+
60-62	D-	63-66	D	67-69	D+
		0-59	F		

Course Repeat Policy: An undergraduate student may not take an undergraduate course of record more than **three times**. A course of record is defined as a course in which a student receives a grade of A, B, C, D, (including + and -) F, U, Z or W. The academic department offering a course may drop a student from a course if the student attempts to take a course more than three times.

The last day to withdraw from a course (and receive the W grade) is March 31, 2023 at 04:30P. Course withdrawals are submitted online.

Inclement Weather Policy: If we should miss a class day due to a school closing because of **weather**, any activities planned for that missed day will take place the next time the class meets. For example, if a test is scheduled for a day that class is canceled on account of snow, the test will be given the next time the class meets.

Cell Phones: Silence (or better yet, turn off) all cellular telephones upon entering the classroom. Leaving class to initiate or receive a telephone call will not be tolerated and students doing so will not be re-admitted to the classroom until the following class meeting. Texting or tweeting during class interferes with the learning process. Students distracted by their cell phones are not engaged in class and will find, over the course of the semester, that learning and course grade will suffer.

Title IX Reporting Responsibilities: Millersville University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment and to comply with Title IX of the Education Amendments of 1972, 20 U.S.C. §1681, *et seq.*, and act in accordance with guidance from the Office for Civil Rights, the University requires faculty members to report to the University's Title IX Coordinator incidents of sexual violence shared by students. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report to the person designated in the University Protection of Minors policy incidents of sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred. Information regarding the reporting of sexual violence, and the resources that are available to victims of sexual violence, is available at <https://www.millersville.edu/titleix/index.php>.

Academic Honesty: Students are required to avoid plagiarism, falsification of their work, cheating (including assisting others in cheating), and other forms of academic misconduct. For more information including definitions and examples of academic dishonesty, please see the [Academic Honesty Policy](#).

Land Acknowledgement: Millersville University would like to recognize the Native peoples of the lower Susquehanna River basin, those known and those unknown to us, who have stewarded the land, upon which Millersville University sits, for thousands of years. We acknowledge that the land on which we gather, study, and work is the ancestral land of the Conestogas, Susquehannocks, Shawnee, and others. One group, the Shenks Ferry people, had a village adjacent to the campus. We pay our respects to the traditional occupants and caretakers of this land.

Other University Policies: Students may wish to consult the links provided below outlining Millersville University's policies on:

- [Inclusivity](#)
- [Preferred names](#)
- [Student rights under FERPA](#)
- [Student conduct and community standards](#)

Final Word: Math is not a spectator sport. What you learn from this course and your final grade depend mainly on the amount of work you put forth. Daily contact with the material through homework assignments and review of notes taken during lectures is extremely important.

No one can guarantee you success in this course. Your responsibilities and the instructor's expectations are outlined above. There will be no second chances or "do-overs".