MATH 2522.B – Applied Linear Algebra (3 cr) / Fall 2024

Textbook:	Intro to Linear Algebra, by L.W. Johnson, R.D. Riess, J.T. Arnold, 5th Ed.
Class Meets:	MWF: 2:20 – 3:10 (Votey 307)
Course webpage:	**https://tlakoba.w3.uvm.edu/24_fall/math_2522/index.html**
Instructor:	Dr. Taras I. Lakoba, Innovation Hall, Room E436
	(802) 656-2610, tlakoba@uvm.edu, **https://tlakoba.w3.uvm.edu**
Student Drop-in Hours:	M: 4:40–5:40; W: 12:30–1:30; F: 11:20 - 12:20; and by appointment.
	See **https://tlakoba.w3.uvm.edu/teaching_24F.html** for more information.
Important deadlines:	See UVM Academic Calendar at
	https://www.uvm.edu/registrar/uvm-academic-calendar-2024-2025

Course contents:

Verbal description: Echelon and reduced echelon forms, consistent linear systems, matrix operations, linear (in)dependence, (non)singular matrices, matrix inverses; properties of vector space R^n, subspaces, bases, coordinates, and dimension, orthogonal bases, linear transformations, least-squares solutions; eigenvalue problems, determinants, eigenvectors and eigenspaces, similarity and diagonalization, singular value decomposition. By Section: 1.1–1.3, 1.5–1.7, 1.8 (if time permits), 1.9; 3.1–3.5, 3.7, 3.8; 4.1, 4.2, 4.4, 4.5, 4.7.

Homework:

Homework is posted on the **course webpage listed above**. Homework for any given section is **considered assigned on the day that section has been covered**.

The purpose of the homework is to help you master the techniques covered in class. As such, **homework problems will be substantially based on examples and material presented in class. Therefore, you should study your notes before you attempt the homework, and mimic your solutions on the examples in the notes** and the indicated examples from the book. Please watch a 15-minute video on the course webpage explaining how I expect you to work on homework problems. See the instructor for help **as soon as** you find out that you are having difficulty with the homework.

Homework will not be graded; however, both quizzes and tests will be based on the homework problems.

Projects:

There will be five projects (to be done outside of lecture time), whose primary purpose will be to show you a connection between the concepts learned in class and some real-life applications. Some of the projects will involve Matlab; however, prior experience with this software is not required.

Tests and Quizzes, and a note about (no) Brightspace / class communication:

(a) In-class quizzes, sometimes unannounced (see below), will be given *approximately* once a week. There will be $10(\pm 1)$ quizzes in total. Each of them will be based on the homework problems that have been due at least one day ago. You are encouraged to ask which section's homework will be covered in the next quiz.

The main purpose of the quizzes is to help you monitor your understanding of the material. If you receive a low grade on a quiz, it is a flag that you need to review the corresponding material. A **structured, 3-step process of such a review** is posted on the course website. If you receive a couple of low quiz grades in a row, see the instructor for help as soon as possible.

I will announce when the next quiz will be and what it will be on *only after someone asks me about that in class*. *Example*: I plan to give a quiz on October 1. If someone asks me in class on October 1 or during a previous class when the next quiz will be, I will answer: "On October 1". If no one asks, I will still give a quiz on that day. I will not answer questions about the next quiz's date and content if asked outside of class, unless that question has already been asked in class. This will be done to encourage your (i) initiative asking questions in class and (ii) attendance.

(b) We will **not use Brightspace in this class**. Instead, course policies as well as Homework and Projects will be posted on the **course webpage listed above**. Announcements will be made via email; therefore, you are expected to check your email at least daily and respond, if asked to do so, within a day.

(c) There will be 3 (three) midterm tests during the semester. Their dates will be announced in class at least a week before each test. In terms of material covered, midterms 1, 2, and 3 will be given after we cover Sections 3.1, 3.7, and 4.5, respectively. *See page 3 of this document for information related to their scheduling.*

Make-up exams will be given to those students who have documented excused absence.

(d) The final exam will be on Thursday, December 12, from 1:30 pm to 4:15 pm in Votey 307.

Academic integrity:

When working on any quizzes and tests, you are **not allowed to use outside help in any form**.

When working on Projects, you are allowed to work with no more than one partner on any given Project. (You may change partners, or work without a partner, on different Projects.) See the **'My Policy on Projects'** on the course webpage. You and your partner may use class notes, textbook, and materials posted on the course webpage. If you decide to use materials found online (which you will *never really need* and hence are *discouraged* from using), you must *conspicuously reference the URL* where the material is found.

Due to the wide spread of Generative AI, you **will not be allowed to use phones** during Quizzes and Exams. You may still use calculators, even though you will never actually need them on these assignments.

Please keep in mind that the purpose of all assignments is *not* to just have you solve a given problem. Rather, it is to assess your mastery *of the methods presented in class* and, therefore, to have you solve the problem *by one of those methods*. I reserve the right, at my sole discretion, to question any solution that, in my opinion, uses a method that was not presented or referred to in class. See the preamble to the document cited in the next paragraph.

Violations of academic integrity on *any assignment* will be dealt with as described in the link **'Sanctions for academic integrity violations'**, found below this Syllabus. **See also** the rubric 'Prohibition of sharing course materials' in the Generic Syllabus (posted next to this one).

Grading policy: <u>Midterms</u> 1, 2, and 3 will be worth 12%, 13%, and 14% of the final grade, respectively. All <u>regular quizzes</u> combined will be worth 23% of the final grade. Each of the 5 <u>projects</u> will be worth 3% of the final grade. The <u>final exam</u> will be worth 23% of the final grade. <u>Extra credit</u> may be earned, as explained below.

Note: I do **NOT** drop your lowest grade. Thus, **ALL** the grades that you earn during the semester will contribute to your final grade, as detailed above.

Grading scheme: I do not curve exams and quizzes. Instead, when issuing final grades, I slightly adjust the grading brackets. This will work as follows. The threshold between $\mathbf{A-}$ and $\mathbf{A}$ will be set at X, where $92.00 < X \leq 93.00$ will be adjusted based on my subjective criteria. The freedom of choosing this X *within the above range* is my equivalent of other instructors' curving exam grades.

Once a value of X is selected, letter grades will be put in correspondence with the following brackets for the numeric grade, which is computed as described in rubric Grading policy:

D$-$ $[X - 30 - 3.33, X - 30)$;	D $[X - 30, X - 30 + 3.34)$;	D$+$ $[X - 30 + 3.34, X - 20 - 3.33)$;
C$-$ $[X - 20 - 3.33, X - 20)$;	C $[X - 20, X - 20 + 3.34)$;	C$+$ $[X - 20 + 3.34, X - 10 - 3.33)$;
B$-$ $[X - 10 - 3.33, X - 10)$;	B $[X - 10, X - 10 + 3.34)$;	B$+$ $[X - 10 + 3.34, X - 3.33)$;
A$-$ $[X - 3.33, X)$;	A $[X, X + 5.00)$;	A$+$ $\geq X + 5.00$.

Note that these brackets are *strict*. This means that if your grade doesn't make the next bracket even by 0.01, that is it — it doesn't make it. This is what brackets, and thresholds in general, are for.

Extra credit: (**No penalty** will be given if you choose not to do any of the extra credit assignments.)

• Extra credit problems will be occasionally posted on the Homework page (see rubric 'Homework' on the first page of this syllabus). They will be graded (on a coarse scale). Before you do a particular extra credit assignment, please review more detailed instructions found on the course website.

• I reserve the right, at my sole discretion, to increase the final grade of any student by one level (e.g., from B- to B) for a demonstrated achievement, some examples of which are: excelling on the final exam, active and constructive class participation, regular and active attendance of office hours with demonstrated transfer of knowledge gained thereby into the performance on assignments, being the "most improved" student in terms of performance or attitude, etc. This provision, however, has been used *only in very rare and truly exceptional cases*.

Learning objectives: Upon successful completion of this course, the students will be able to recognize and independently work with the following concepts: Gaussian elimination and Reduced Echelon Form of a linear system; Linear (in)dependence of vectors; (Non-)singular matrices; Vector spaces and subspaces; Basis for a vector space; Linear transformations; Least-square solution of inconsistent linear systems; Eigenvalues and eigenvectors; Similarity transformation and Diagonalization of a matrix.

Information about midterm exams in MATH 2522

- All three midterms will be scheduled outside of class in the evening. The benefit of doing so for the instructor (and presumably for the students) is that this will save the class time and will allow a slower pace of the exposition of the material. The benefit for the students is that exams held outside of class can be scheduled for longer than 60 minutes.

  Tentatively, the exams will be scheduled during the weeks of September 30, October 28, and November 18.[1] The procedure described below *supersedes* the above dates (which, again, are *only approximate*).

- Scheduling an outside exam will work as follows. About 8–10 days before the exam, I will send an email to the class with the following content:

  Class:

  The preparation sheet for Test `N` has been posted on the course webpage.
  I would like to schedule Test `N` within one of the following time slots:

  `weekday 1, month/date, time block 1`
  `weekday 2, month/date, time block 2.`

  This test will be for `XX` minutes.

  Please let me know what times within the above two slots you can NOT make. I will NOT be able to accommodate preferences, only hard "cannot"s.

  Please let me know that by `deadline time` this upcoming `weekday, date`.[2]

  If you can make any time within the above slots, you do not need to respond.

  If you can NOT make any part of the above time, I will still extend an offer of individual accommodation to you. HOWEVER, I will extend such offers only to those students who have responded by the above deadline of `date`. If you miss the deadline, you'll have to take the test at the times which I will select based on responses of the other students.

  The students with ACCESS accommodation are to schedule a time with the EPC
  (https://www.uvm.edu/academicsuccess/exam-proctoring-center; epc@uvm.edu; 802-656-5767).
  Please make sure to let the EPC staff know that the base time for the exam is `XX` minutes.

- Soon after the deadline time mentioned above, I will select a time based on the responses that I have received. I will also send offers of individual accommodation as described above and will ask these respective students to respond within 24 hours. If I do not receive a response by then, the offer of individual accommodation WILL BE WITHDRAWN, and the non-responsive student will need to TAKE THE EXAM WITH THE OTHER STUDENTS.

- Information about the location of the exam will be sent soon after the exam is scheduled.

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[1] As noted on page 1, the actual dates will be scheduled in about a week after we cover sections 3.1, 3.7, and 4.5.
[2] Usually, I will allow 3 days for a response.