Math 2270 - 005: **Linear Algebra**
Fall 2026
Meeting Days MTWF 10:45-11:35 in FASB 295
Course Web Page: https://www.math.utah.edu/~treiberg/M2276.html

Zoom:

MTWF lectures will be held in person and simultaneously zoomed.
Zoomed sessions will be recorded and notes will be made available on Canvas.
Contact info for lectures:

Starting Aug. 24, 2026 10:45 am
Join Zoom Meeting

Zoom contact information is available in the syllabus in canvas.

Canvas Page: https://utah.instructure.com/courses/??????

Instructor Information

Instructor: Andrejs Treibergs
Email: treiberg@math.utah.edu
Office Hours: MWF 11:50 - 12:50 and by appointment
Office Location: JWB224

Course Description

Math 2270 is a 4 credit course. The main topics covered include Euclidean space, linear systems, Gaussian elimination, determinants, inverses, vector spaces, linear transformations, quadratic forms, least squares and linear programming, eigenvalues and eigenvectors, diagonalization. Includes theoretical and computer lab components.
Prerequisites: 'C' or better in MATH 1260 OR MATH 1320 OR MATH 1321 OR MATH 2210 OR MATH 2310 OR 'B' or better in MATH 1220 OR AP Calculus BC score of 5

Course Outcomes and Objectives

By the end of this course, you will be able to:
- Solve systems of linear equations by a variety of methods which may include any of the following: Gaussian elimination, Gauss-Jordan elimination, using an inverse matrix (if applicable), or Cramer's rule (if applicable).
- Determine if a set of vectors has certain properties such as linearly independence, linearly dependence, is a basis, is orthogonal or orthonormal
- Apply standard matrix operations including computing the inverse of an invertible matrix
- Identify invertible matrices using a variety of equivalent conditions
- Evaluate determinants of square matrices using cofactor expansion or row reduction.
- Construct bases for a variety of subspaces, which may include any of the following: row space of a matrix, column space of a matrix, null space of a matrix, eigenspace of a matrix, kernel of a linear transformation, or range of a linear transformation.
- Calculate the eigenvalues of a square matrix.
- Diagonalize a square matrix or determine that it is not diagonalizable.
- Construct an orthonormal basis for an inner product space by using the Gram-Schmidt

process.
- Compute and analyze the Singular Value Decomposition of a matrix; identify properties of the matrix or its associated linear transformation based on the SVD and vice versa.

Course Requirements

The final grade is based on the following components:

- Online Homework (18%) - Weekly homework will be completed using the online platform MyLab (required). Access to the online homework is included with the Day 1 Book Access program. If you plan to opt out of the Day 1 Book Access program, there are options for purchasing access to the homework directly.
  Homework will be due Sunday nights at 11:59pm.
  Late homework policy: Homework can be completed after the deadline for up to 80% credit of the remaining points. Otherwise, no further extensions will be granted except for in unordinary circumstances.
- Two midterm exams (26% each) - Two midterm exams will be given during regular class time. The exact dates are below. The lower midterm exam score can be replaced by the final exam score if higher. No make-up exams will be given except for university approved absence, or unusual circumstances involving personal or family emergencies.
  o Exam 1: Wednesday, September 23;
  o Exam 2: Wednesday, November 4.
- Comprehensive Final Exam (30%) - A comprehensive final exam will be given at the end of the semester (exact date below). It will cover all topics in the course and counts towards 30% of your final grade. The lowest midterm score can be replaced by the final exam score if higher.
  Final Exam: Wednesday, December 16, 10:30 am - 12:30 pm.

Students with university excused absences (band, debate, student government, intercollegiate athletics) should make alternate arrangements with me as soon as possible if the absence interferes with any course components.

Calculator Policy

Calculators will not be allowed on quizzes or exams. They may be used on homework, but you should still write out the details of your computation. Every computation in this class can be done with an online calculator or appropriate code (Python, Matlab, etc). You can and should use these tools to check your answers and enhance your understanding of the material. However, utilizing only these resources – not solving problems by hand – will leave you unprepared for the exams but more importantly, it will stifle your ability to internalize the concepts learned in this course.

Canvas Policy

Canvas will be used for posting course announcements, grades, files and any relevant supplementary material. You are also welcome to make use of the Canvas discussion board to discuss course problems or topics. You can access the Canvas page through CIS or by logging in at utah.instructure.com. Students should check the Canvas page regularly for course information and resources.

Email notifications and correspondence will be sent to the student's UMail address ([u-number]@utah.edu); this email account must be checked regularly.

Required Readings

The textbook for this course is required and is available through Canvas. We will cover most of Chapters 1-7.
Linear Algebra and Its Applications (sixth edition)

David C. Lay, Steven R. Lay, Judi J. McDonald

Grading Scale

Canvas will always display a “Total” score. This is a tool to help you approximate your current grade in the course but it is not your official grade. Your final course grade will be calculated at the end of the semester and will be converted to a letter grade based on the following table.

Letter Grade	% Range	Letter Grade	% Range
A	[93,100]	C	[73,77)
A-	[90,93)	C-	[70,73)
B+	[87,90)	D+	[67,70)
B	[83,87)	D	[63,67)
B-	[80,83)	D-	[60,63)
C+	[77,80)	E	[0,60)

Preliminary Course Schedule

Week Number, Dates, Sections, Topic, Homework, Tests and Registration Information

- Week 1 8/24 - 8/28

Sections: 1.1, 1.2
Systems of linear equations, row reduction and echelon forms, finding solutions of linear systems

- Week 2 8/30 - 9/4

Sections Sections: 1.3, 1.4, 1.5
Vector equations, the matrix equation $Ax = b$, solution set to linear systems

Add/Drop Deadline: 9/4

HW 1.1, 1.2, 1.3

- Week 3 9/7 - 9/11

Sections: 1.7, 1.8, 1.9
Linear independence, linear transformations,

Labor Day: 9/7

HW 1.4, 1.5, 1.7

- Week 4 9/14 - 9/18

Sections: 2.1, 2.2, 2.3
Matrix operations, matrix inverses and their characterizations

HW 1.8, 1.9, 2.1

- Week 5 9/21 - 9/25

Sections: 2.5, 2.8, 2.9
Matrix factorizations, subspaces of Euclidean Space, dimension and rank

Exam 1

HW 2.2, 2.3, 2.8

- Week 6 9/28 - 10/2

Sections: 3.1, 3.2, 3.3
Determinants and their properties, Cramer’s rule

HW 2.9

- Week 7 10/5 - 10/9

Sections: 4.1 - 4.6
Abstract vector spaces, coordinate systems, dimension

HW 3.1, 3.2, 3.3

- Fall Break 10/12 - 10/16

- Week 8 10/19 - 10/23

Sections: 5.1, 5.2
Eigenvalues and eigenvectors, the characteristic equation

HW 4.1 - 4.6

- Week 9 10/26 - 10/30

Sections: 5.3, 5.4, 5.5
Diagonalization

Withdraw Deadline: 10/30

HW 5.1, 5.2

- Week 10 11/2 - 11/6

Sections: 6.1 - 6.3
Inner products, orthogonal and orthonormal sets, projection

HW 5.3, 5.4, 5.5

Exam 2

- Week 11 11/9 - 11/13

Sections: 6.4, 6.5, 6.7, 6.8
The Gram-Schmidt process, least squares problems, inner product spaces

HW 6.1 - 6.3

- Week 12 11/16 - 11/20

Sections: 7.1, 7.2
Symmetric matrices, quadratic forms

HW 6.4, 6.5, 6.7

- Week 13 11/23 - 11/27

Sections: 7.3
Constrained optimization

Thanksgiving Break: 11/26 - 11/27

- Week 14 11/30 - 12/4

Sections: 7.4, 7.5
Singular Value Decomposition and its applications

HW 7.1 - 7.3

- Week 15 12/7 - 12/11

Catchup and/or Review

Last day of classes: Thursday, 12/10

HW 7.4

- Final's Week 12/14 - 12/18

Final Exam Date/Time: Wed. 12/16, 10:30 am - 12:30 pm

This syllabus is subject to change at the discretion of the instructor.

How to Succeed in this Class:

If you follow the suggestions in this section you will save time and understand the subject more deeply and more effectively.

- Mathematics in general, and Linear Algebra in particular, is hierarchical. Everything we do in an organized class like this is a small extension of what we did previously, often the day before. If you understand what we did yesterday you will easily understand what we do today. If you do not, what we do today will be confusing, and making sense of it will be difficult and time consuming.
- Read the relevant section in the textbook before each class. After class make sure you understand what we did in class.
- Pay careful attention to the precise language we will develop in this class. If you don't understand a word or phrase, stop, go back and review that word or phrase before going on. If you don't understand the language you can't effectively think about the subject, and you won't understand it.
- Do the home work problems corresponding to a certain textbook section after we cover the topic in class, and before you attend the next class
- Nowadays most linear algebra problems are solved by computer. We need to understand linear algebra so that we can tell computers what to do, and to understand what they are doing. So this class is focused on understanding concepts, facts, properties, and connections. We will do some (small) computations to deepen our understanding, and it's in the nature of computer graded home work that much of it is computational. However, you want to concentrate your attention on the concepts, rather than acquiring computational facility. You will often need to read my or your notes, or the textbook, repeatedly before you understand what's happening.

Come to class. I will cover much more verbally than what is written in the notes. Attendance is not recorded but it is essential for effective learning.

I recommend that you form a study group with one or two class mates and meet on a regular basis to study together and to work on the homework together. The purpose of the homework is to help you understand the subject, so you should organize your team work so that every member of your group fully understands what is happening in each problem.

Seek help! Talk with your classmates, ask tutors in the math center, and don't hesitate to contact me with your queries.

University Policies

Updated mandatory syllabus policies regarding the ADA Act, Safety at the U, Addressing Sexual Misconduct, and Academic Misconduct can be viewed at: https://cte.utah.edu/instructor-education/syllabus/institutional-policies.php

Drop/Withdrawal Policy

Students may drop a course within the first two weeks of a given semester without any penalties. Students may officially withdraw (W) from a class or all classes after the drop deadline through the midpoint of a course. A “W” grade is recorded on the transcript and appropriate tuition/fees are assessed. The grade “W” is not used in calculating the student’s GPA. For deadlines to withdraw from full-term, first, and second session classes, see the U's Academic Calendar.

Current mandatory University syllabus policies regarding ADA Act, Safety at the U, Addressing Sexual Misconduct, and Academic Misconduct are listed here. They can also be viewed at: https://cte.math.utah.edu/instructor-education/syllabus/institutional-policies.php

Americans With Disabilities Act (ADA)

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities.

All written information in this course can be made available in an alternative format with prior notification to the Center for Disability & Access (CDA). CDA will work with you and the instructor to make arrangements for accommodations. Prior notice is appreciated. To read the full accommodations policy for the University of Utah, please see Section Q of the Instruction & Evaluation regulations. https://regulations.utah.edu/academics/6-100.php

In compliance with ADA requirements, some students may need to record course content. Any recordings of course content are for personal use only, should not be shared, and should never be made publicly available. In addition, recordings must be destroyed at the conclusion of the course.

If you will need accommodations in this class, or for more information about what support they provide, contact:

Center for Disability & Access

801-581-5020
disability.utah.edu
162 Union Building
200 S. Central Campus Dr.
Salt Lake City, UT 84112

Mandatory Reporting for Sexual Harassment

Responsible employees are required under University policy to inform the Office of Equal Opportunity (OEO) of all reports of discrimination or sexual misconduct. Some employees (e.g. campus security authorities, those classified as confidential) are not required to report to OEO, but may have other reporting obligations. Learn more about how the OEO reporting process functions.

Title IX Accommodations for Pregnant Students

Pregnant and parenting students are protected through Title IX from discrimination in educational settings. Students may request reasonable modifications through the Title IX Office as a result of pregnancy or pregnancy-related conditions.

For further support, please contact:
Title IX Coordinator & Office of Equal Opportunity and Affirmative Action
801-581-8365
oeo.utah.edu
135 Park Building
201 Presidents' Cir.
Salt Lake City, UT 84112

Lauren's Promise

Lauren' s Promise is a vow that anyone– faculty, staff, students, parents, and community members– can take to indicate to others that they represent a safe haven for sharing incidents of sexual assault, domestic violence, or stalking. Anyone who makes Lauren' s Promise vows to:

- Listen to and believe those individuals who are being threatened or experiencing sexual assault, dating violence or stalking;
-

Represent a safe haven for sharing incidents of sexual assault, domestic violence, or stalking, and;

- Change campus culture that responds poorly to dating violence and stalking.

By making Lauren's Promise, individuals are helping to change campus cultures that respond poorly to dating violence and stalking throughout the nation.

Indigenous Land Acknowledgement

The University of Utah has both historical and contemporary relationships with Indigenous peoples. Given that the Salt Lake Valley has always been a gathering place for Indigenous peoples, we acknowledge that this land, which is named for the Ute Tribe, is the traditional and ancestral homelands of the Shoshone, Paiute, Goshute, and Ute Tribes and is a crossroad for Indigenous peoples.

The University of Utah recognizes the enduring relationships between many Indigenous peoples and their traditional homelands. We are grateful for the territory upon which we gather today; we respect Utah's Indigenous peoples, the original stewards of this land; and we value the sovereign relationships that exist between tribal governments, state governments, and the federal government. Today, approximately 60,000 American Indian and Alaska Native peoples live in Utah. As a state institution, the University of Utah is committed to serving Native communities throughout Utah in partnership with Native Nations and our Urban Indian communities through research, education, and community outreach activities.

Student Wellness

Your personal health and wellness are essential to your success as a student. Personal concerns like stress, anxiety, relationship difficulties, depression, or cross-cultural differences can interfere with a student's ability to succeed and thrive in this course and at the University of Utah. Please feel welcome to reach out to your instructor or TA to handle issues regarding your coursework.

For helpful resources to manage your personal wellness and counseling options, contact:

Counseling Services
801-581-6826
counselingcenter.utah.edu
Student Services Building
201 South 1460 East, Rm 426
Salt Lake City, UT 84112

Center for Student Wellness
801-581-7776
wellness.utah.edu
2100 Eccles Student Life Center
1836 Student Life Way
Salt Lake City, UT 84112

Student Support at the U

Your success at the University of Utah is important to all of us here! If you feel like you need extra support in academics, overcoming personal difficulties, or finding community, the U is here for you. Please refer to the Student Support Services page for the U for updated information.

Basic Needs Collective

Success at The University of Utah includes learning about and using available resources. The Basic Needs Collective (BNC) is a coordinated resource referral hub.

They educate about and connect students to campus and community resources to help them meet their basic needs. As a central location for resource referrals related to food, housing, health insurance, managing finances, legal services, mental health, etc., any student experiencing difficulties with basic needs is encouraged to contact them. Drop into their office located in the Union basement, or schedule with them online for an in-person or virtual visit through their webpage: basicneeds.utah.edu.

Academic Misconduct

It is expected that students comply with University of Utah policies regarding academic honesty, including but not limited to refraining from cheating, plagiarizing, misrepresenting one's work, and/or inappropriately collaborating. This includes the use of generative artificial intelligence (AI) tools without citation, documentation, or authorization. Students are expected to adhere to the prescribed professional and ethical standards of the profession/discipline for which they are preparing. Any student who engages in academic dishonesty or who violates the professional and ethical standards for their profession/discipline may be subject to academic sanctions as per the University of Utah's Student Code: Policy 6-410: Student Academic Performance, Academic Conduct, and Professional and Ethical Conduct.
https://regulations.utah.edu/academics/6-410.php

Plagiarism and cheating are serious offenses and may be punished by failure on an individual assignment, and/or failure in the course. Academic misconduct, according to the University of Utah Student Code:

"...Includes, but is not limited to, cheating, misrepresenting one's work, inappropriately collaborating, plagiarism, and fabrication or falsification of information... It also includes facilitating academic misconduct by intentionally helping or attempting to help another to commit an act of academic misconduct."

For details on plagiarism and other important course conduct issues, see the U's Code of Student Rights and Responsibilities.
https://regulations.utah.edu/academics/6-400.php

Dignity/Belonging Statement

I stand in support of compassion, dignity, value-of-life, fair treatment, belonging, and justice for all individuals regardless of color, race/ethnicity, sexual orientation, religion, language, socioeconomic status, ability, gender, gender identity or expression, immigration status, or any type of marginalization. I stand in support of making our society more fair and compassionate for all individuals. I stand against discrimination in all its various forms.