Master Course Syllabus

For additional course information, including prerequisites, corequisites, and course fees, please refer to the Catalog: https://catalog.uvu.edu/

Semester: Spring
Year: 2025
Course Prefix: MATH
Course and Section #: 4330-002
Course Title: Theory of Linear Algebra
Credits: 3

Course Description

Covers vector spaces, linear transformations and matrices, dual spaces, inner product spaces, orthogonality, bilinear forms, eigenvalues, eigenvectors and generalized eigenvectors, diagonalization, and Jordan and other canonical forms.

Course Attributes

This course has the following attributes:
☐ General Education Requirements
☐ Global/Intercultural Graduation Requirements
☐ Writing Enriched Graduation Requirements
x Discipline Core Requirements in Program
x Elective Core Requirements in Program
☐ Open Elective
Other: *Click here to enter text.*

Instructor Information

Instructor Name: Dr. Wiktor Mogilski

Student Learning Outcomes

Upon successful completion of this course a student is able to:
1. State important definitions and theorems related to vector spaces, linear transformations, and inner products.
2. Describe the significance of important definitions and theorems related to vector spaces, linear transformations, and inner products.
3. Describe the solvability of a linear operator equation including existence and uniqueness of solutions.
4. Perform computations related to linear transformations and bases, including finding matrices of linear transformations with respect to various bases, orthonormal bases of various inner product spaces via the Gram-Schmidt process, and dual bases.
5. Compute eigenspace information including characteristic polynomials, eigenvalues, eigenvectors and generalized eigenvectors, and the Jordan and other canonical forms of a matrix.
6. Prove mathematical statements related to vector spaces, linear transformations, dual spaces, inner product spaces, bilinear forms, eigenvalues and eigenspaces, and canonical forms of matrices.
7. Provide examples of vector spaces, inner products, bilinear forms, and matrices and forms of varying types.

Course Materials and Texts

Linear Algebra Done Wrong by Sergei Treil. This is a FREE textbook that can be obtained at: https://www.math.brown.edu/streil/papers/LADW/LADW.html

Course Requirements

Homework Assignments

For every week of covered topics there will be a posted homework problem set on Canvas. This set will contain problems similar to ones that might appear on an exam as well as some more challenging problems. I will also post the key to the worksheet on Canvas a little later.

You are to work all of the problems without the key first. You may get help from me if you wish. You are then to check your work against the key. For any problems you get wrong, make notes with a different color pen that describe the mistake. Then on a separate piece of paper, rewrite the problem correctly. This self-graded set with corrections will be submitted on Canvas and graded for completeness and is worth 30 points.

As long as you do the above, you will always get full credit on your homework. Since a provided answer key is part of the homework submission process, late homework will not be accepted.

Homework Guidelines

Please follow the guidelines below when completing homework assignments:

- Homework must be legible. Make sure to write your name on the first page, and name or initials on the remaining pages.
- Please leave ample space between problems so I have room to make any comments.
- You are not allowed to work with other students on homework assignments.
- The text and lectures/lecture notes are the only sources permitted for working on homework. Outside sources (internet, solutions manuals, other texts, etc.) are *prohibited*.
- All proofs must be written using words, paragraphs, complete sentences, and proper grammar, spelling, capitalization, and punctuation. Whenever possible, minimize the use of mathematical symbols.
- A reason or justification must be given for every statement that does not follow immediately from basic, well-established results. To justify a statement, cite a hypothesis from the problem or cite a definition or result from the text or lectures.

Regarding last two bullet points, I am not expecting you to be proficient in mathematical writing... the goal of this course is to help hone these skills. Please meet with me if you have any doubts or questions about your homework solutions!

Presentations

Throughout the semester there will be several homework discussion sessions. Each student will be required to present the solution to a total of 2 homework problems throughout the semester at the board. Only one problem presentation is allowed per discussion session. If you present a problem during one session, then you will not be able to present a problem in the next session. This will ensure a fair distribution of presentation material.

Exams
There will be a total of three exams. No notes or textbooks are allowed on exams. The first two exams will be taken on Canvas using Proctorio and the last exam will be in person. No exam scores will be dropped and make-up exams are only allowed with an instructor approved excuse. A part of each exam will consist of reproducing definitions, statements from class, and recreating homework assignments. The last exam for this course will be **Monday, April 28, 1:00-2:50pm**. Failure to take the last exam will result in a grade of E (based on last date of attendance) for the course regardless of other grades. It is University policy that no one will be permitted to take a final exam early.

Grade Scale

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

Grade Breakdown
Your grade for this class will consist of the following:

- Written Homework: 20%
- Presentations: 5%
- Each of 3 exams: 25%

Required or Recommended Reading Assignments
All textbook chapters.

General Description of the Subject Matter of Each Lecture or Discussion

- Chapter 1: Basic Notions
- Chapter 2: Vector Spaces
- Exam 1: Chapters 1-3
- Chapter 3: Determinants
- Chapter 4: Introduction to Spectral Theory
- Chapter 5: Inner Product Spaces
- Exam 2: Chapters 3-5
- Chapter 6: Structure of Operators in Inner Product Spaces
- Chapter 7: Bilinear and Quadratic Forms
- Chapter 8: Dual Spaces
- Chapter 9: Advanced Spectral Theory
- Exam 3: Chapters 6-9

Required Course Syllabus Statements

Generative AI
This course requires you to complete assignments that assess your understanding, application, and problem-solving ability applied to chemistry. You are expected to do your own work. Problem solving and scientific thinking are tools that are necessary for students to learn in this course. The use of artificial intelligence (AI) tools, such as chatbots, text generators, paraphrasers, summarizers, or solvers, is strictly prohibited for any part of your assignments. Using these tools will be considered academic dishonesty and will be handled

according to the university's academic honesty policy. If you have questions about acceptable use of AI tools, please consult the instructor before submitting your work.

Using Remote Testing Software

☐ This course does not use remote testing software.

x This course uses remote testing software. Remote test-takers may choose their remote testing locations. Please note, however, that the testing software used for this may conduct a brief scan of remote test-takers' immediate surroundings, may require use of a webcam while taking an exam, may require the microphone be on while taking an exam, or may require other practices to confirm academic honesty. Test-takers therefore shall have no expectation of privacy in their test-taking location during, or immediately preceding, remote testing. If a student strongly objects to using test-taking software, the student should contact the instructor at the beginning of the semester to determine whether alternative testing arrangements are feasible. Alternatives are not guaranteed.

Required University Syllabus Statements

Accommodations/Students with Disabilities

Students needing accommodations due to a permanent or temporary disability, pregnancy or pregnancy-related conditions may contact UVU Accessibility Services at accessibilityservices@uvu.edu or 801-863-8747.

Accessibility Services is located on the Orem Campus in BA 110.

Deaf/Hard of Hearing students requesting ASL interpreters or transcribers can contact Accessibility Services to set up accommodations. Deaf/Hard of Hearing services can be contacted at DHHservices@uvu.edu

DHH is located on the Orem Campus in BA 112.

Academic Integrity

At Utah Valley University, faculty and students operate in an atmosphere of mutual trust. Maintaining an atmosphere of academic integrity allows for free exchange of ideas and enables all members of the community to achieve their highest potential. Our goal is to foster an intellectual atmosphere that produces scholars of integrity and imaginative thought. In all academic work, the ideas and contributions of others must be appropriately acknowledged and UVU students are expected to produce their own original academic work.

Faculty and students share the responsibility of ensuring the honesty and fairness of the intellectual environment at UVU. Students have a responsibility to promote academic integrity at the university by not participating in or facilitating others' participation in any act of academic dishonesty. As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, assessments, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Likewise, instructors are responsible to clearly state expectations and model best practices.

Further information on what constitutes academic dishonesty is detailed in UVU Policy 541: *Student Code of Conduct*.

Equity and Title IX
Utah Valley University does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, age (40 and over), disability, veteran status, pregnancy, childbirth, or pregnancy-related conditions, citizenship, genetic information, or other basis protected by applicable law, including Title IX and 34 C.F.R. Part 106, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Inquiries about nondiscrimination at UVU may be directed to the U.S. Department of Education's Office for Civil Rights or UVU's Title IX Coordinator at 801-863-7999 – TitleIX@uvu.edu – 800 W University Pkwy, Orem, 84058, Suite BA 203.

Religious Accommodation
UVU values and acknowledges the array of worldviews, faiths, and religions represented in our student body, and as such provides supportive accommodations for students. Religious belief or conscience broadly includes religious, non-religious, theistic, or non-theistic moral or ethical beliefs as well as participation in religious holidays, observances, or activities. Accommodations may include scheduling or due-date modifications or make-up assignments for missed class work.
To seek a religious accommodation, a student must provide written notice to the instructor and the Director of Accessibility Services at accessibilityservices@uvu.edu. If the accommodation relates to a scheduling conflict, the notice should include the date, time, and brief description of the difficulty posed by the conflict. Such requests should be made as soon as the student is aware of the prospective scheduling conflict.

While religious expression is welcome throughout campus, UVU also has a specially dedicated space for meditation, prayer, reflection, or other forms of religious expression.