Math 352: Linear Algebra
Spring 2026
Syllabus

Professor: Josh Laison
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Student Office Hours: You don't need an appointment to come see me at these times.
Monday, Thursday 1:00-2:00
Friday 10:00-11:00

You are very welcome to talk with me at other times. If I'm in my office you can drop by without an appointment, or you can schedule an appointment via email to meet in person or over Google Meet.

Class Meetings: Ford 201, 9:40-11:10 Tuesday, Thursday

Textbook: Contemporary Linear Algebra, Howard Anton and Robert Busby

Course Web Page containing the current schedule of topics and assignments by day:
http://www.willamette.edu/~jlaison/linear.html **Course Canvas site:**
https://willamette.instructure.com/courses/9229

Software:
Webwork for automatically graded homework assignments
Google Colaboratory for coding in Python

Grading:

Conceptual homework	15%
Applied homework	15%
WebWorK	15%
Quizzes	25%
Final exam	20%
Final presentations	10%
Total	100%

Student Learning Outcomes: In this course I hope you will gain knowledge of a variety of topics in linear algebra; gain experience thinking about linear algebraic ideas from theoretical, algorithmic, and applied viewpoints; improve your problem-solving, logical, and analytic skills; gain facility using technology to solve linear algebraic problems; and gain experience communicating about linear algebra in conversation and formal presentation.

Student Learning Outcomes for the Mathematics Major:

1. Develop content depth and breadth of knowledge in mathematics and related subjects
2. Communicate ideas clearly both in oral presentations and in written expository or argument driven work

3. Gain independence as a reader and writer of mathematical proofs and/or quantitative arguments

4. Use technology to solve problems and use appropriate tools for applications

5. Collaborate in group problem solving and participate in a community of scholars

You will have three types of homework assignments:

WebWorK: (one or two a week) Shorter exercises focusing on computational skills. Graded by the WeBWorK system.

Conceptual homework: (once a week) These problems will focus on understanding mathematical principles rather than performing computations. You'll get time during class to work on these problems, and each graded assignment will be a combination of a few days' worth of class topics.

Applied homework: (once every two weeks) In these assignments, you'll get a chance to apply the mathematical techniques we're developing to some more realistic, exploratory project-style problems, including some coding in Python.

Please use the math hearth and my office hours often to work together and ask questions. Using office hours is a standard part of class, not a last resort.

Coding: We'll spend time practicing with Python in class. I hope to provide entry points for people with a range of coding experiences. If you have extensive coding experience, please help those in class who are just starting their coding journey.

Quizzes: (Around once every two weeks, 30 minutes each) The quizzes will test your understanding of the fundamental ideas of the course, including short computations and examples.

Attendance at the Math Department Colloquium: According to math department policy, since you are enrolled in a 200-level mathematics course, you are required to attend at least 2 mathematics department colloquium talks this semester. The goal of this requirement is to expose you to a wider range of mathematics, and to make you want to go to more than 2 talks! I hope you will decide by the end of the semester, as I have, that math talks are a lot of fun.

Course Policies

Community: (Adapted from Federico Ardila) This course aims to offer a joyful, meaningful, and empowering experience to every participant. As a community of scholars, our work gets better when we're all invested in a common effort of learning and discovery. We will build that rich experience together by supporting each other. Please be prepared to take an active, critical, patient, and generous role in your own learning and that of your classmates.

Anti-racism: (Adapted from the Office of Equity, Diversity and Inclusion) I affirm our commitment to anti-racist action in the coming semester and beyond. I stand in solidarity with those who have been calling for justice and working to end institutionalized racism and white supremacy across the country and at Willamette.

Systemic racism at Willamette University is not an issue that can be addressed superficially. It will take a deep commitment from all parts of our community to make the changes that are

necessary, and that is what I offer here: a commitment to gather, build, and act on a clear anti-racist agenda together.

Land Acknowledgement: (Adapted from the Dean's Office) Willamette is built on the land of the Kalapuya, who today are represented by the Confederated Tribes of the Grand Ronde and the Confederated Tribes of the Siletz Indians. We offer gratitude for the land, for those who have stewarded it, and for the opportunity to work on it. We acknowledge that our University's history is fundamentally tied to the first colonial developments in the Willamette Valley.

Diversity and Accessible Education Statement: (Adapted from the Accessible Education Services Office) Willamette University and I value diversity and inclusion. We are committed to a climate of mutual respect and full participation. My goal is to create a learning environment that is usable, equitable, inclusive and welcoming for people of any gender identity or expression, race, color, national or ethnic origin, religion or religious belief, age, marital status, sexual orientation, or ability.

If there are aspects of the instruction or design of this course that result in barriers to your inclusion or accurate assessment or achievement, please notify me as soon as possible. Students with disabilities are also encouraged to contact the Accessible Education Services office in Smullin 155 at `https://willamette.edu/offices/accessibility` or `accessible-info@willamette.edu` to discuss a range of options to removing barriers in the course, including accommodations.

Religious Accommodations: (Adapted from the former Office of the Chaplain) I recognize the value of religious practice and I will accommodate your commitment to your religious traditions whenever possible. If you anticipate missing class for religious reasons, please contact me to discuss your needs.

Time Commitment: Willamette's Credit Hour Policy expects 2-3 hours of work outside of class for every hour of in-class time. Since this class meets for three hours a week you should anticipate spending between 6 and 9 hours outside of class engaged in course-related activities.

Academic Integrity: (Adapted from the Dean's Office) Plagiarism can take different forms, but its essence is presenting the words or work of another person as your own. When you are quoting from, paraphrasing, or using images created by another person in any of your work, you should acknowledge that source in a citation.

On homework assignments, you are encouraged to discuss the homework with fellow students, and get help from your professor, textbook, notes, or calculator, but your submitted written work should be your own. Don't use solutions generated by someone else, including AI. On the quizzes and final exam, you shouldn't consult other sources at all.

AI policy: As with any other source, presenting the work of AI as if it was your own is plagiarism. Additionally, many mathematical statements generated by AI are false, and can lead you to misunderstanding if you don't independently verify the results. As with any other source, avoid using information presented by AI in place of your own understanding.

Topics Covered: (subject to change)

Fundamental ideas

Review of vectors, lines, and planes in 2D and 3D	Sections 1.1, 1.2, 1.3
Systems of linear equations	Sections 2.1, 2.2
Application: Splines and typography	
Matrices and matrix algebra	Sections 3.1, 3.2, 3.3
Application: Discrete dynamical systems and Markov chains	Section 5.1
Subspaces	Sections 3.4, 3.5
Application: Error correcting codes	
Linear transformations	Sections 6.1, 6.2, 6.3, 6.4
Application: Computer graphics	Section 6.5
Bases and dimension	Sections 7.1, 7.2, 7.3, 7.4
Application: Best approximation and least squares	Section 7.8
Eigenvalues and eigenvectors	Sections 4.4, 8.2
Application: Singular value decomposition and image processing	Section 8.6

Additional important topics, as time warrants

Determinants	Sections 4.1, 4.2
General vector spaces	Sections 9.1, 9.3
Projection	Sections 7.7, 7.8
Coordinates and change of basis	Sections 7.11, 8.1

Final project topics

Gauss-Seidel and Jacobi iteration (Applied math)	Section 5.3
The Power method and internet search (Computer science)	Section 5.4
Quadratic forms (Analysis)	Section 8.4
Systems of differential equations (Applied math and physics)	Section 8.10
Inner product spaces and Fourier series (Applied math and physics)	Section 9.2

Graph eigenvalues (Graph theory)
Beineke and Wilson, Topics in Algebraic Graph Theory, Chapter 1

Discrete Fourier transforms (Applied math and differential equations)
Strang, Linear Algebra and its Applications, Section 3.5
Hoffman, Leonard, Lindner, Phelps, Rodger, Wall, Coding Theory

Finite affine planes and SET (Geometry)
The Joy of SET, Gordon, Gordon, McMahon, and Gordon, Chapter 8

Bézier curves and splines (Applied math, engineering, typography)
Lyche and Mørken, Spline Methods

Collaborative filtering and Netflix (Applied math, marketing)
Bokde, Girase, Mukhopadhyay, Matrix Factorization Model in Collaborative Filtering Algorithms: A Survey