MATH 307 Applied Linear Algebra   *Course Outline 2024-2025 W2*

Acknowledgement

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the Musqueam people. The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on in their culture, history, and traditions from one generation to the next.

Instructors

Name	*Office*	*Contact*
Yaniv Plan (he/him)	MATH Annex 1219	Canvas inbox message system
Ozgur Yilmaz (he/him)	MATH Annex 1113	oyilmaz@math.ubc.ca
Ahmet Alacaoglu (he/him)	MATH Annex 1114	ahmet.alacaoglu@ubc.ca

Lectures

Section	*Instructor*	*Time*	*Location*
201	Yaniv Plan	MWF 12–1pm	ESB 1012
202	Ozgur Yilmaz	TTh 11am –12:30pm	CHEM D300
203	Ahmet Alacaoglu	MWF 12–1pm	LASR 102

Important Dates

Monday, January 6	Term begins
Wednesday, February 5	Midterm 1 (Sections 201, 203)
Thursday, February 6	Midterm 1 (Section 202)
February 17-21	Midterm Break (No lectures)
Thursday, March 20	Midterm 2 (Section 202)
Friday, March 21	Midterm 2 (Sections 201, 203)
Friday, April 8	Last day of classes
April 12-27	Final exam period

- See the UBC Academic Calendar 2024/2025

Prerequisites

Linear Algebra	One of MATH 152, MATH 221, MATH 223
Multivariable Calculus	One of MATH 200, MATH 217, MATH 226, MATH 253, MATH 254

Learning Goals

- Summarize properties and constructions of matrix decompositions LU, QR and SVD
- Perform matrix computations using mathematical software Python, SciPy and Jupyter
- Compute solutions of systems of linear equations using matrix decompositions
- Compute least squares approximations of linear systems using matrix decompositions
- Approximate eigenvalues and eigenvectors using numerical methods
- Analyze digital signals using the discrete Fourier transform
- Create and analyze mathematical models of real-world phenomenon

Textbooks

MATH 307 Applied Linear Algebra	Linear Algebra with Applications
Scientific Computing	Mathematical Python

Canvas and Piazza

Announcements, assignments, grades, lecture notes and all other course information will be posted on Canvas. Please check it often! Use Piazza to ask and answer questions about lecture notes, textbook exercises, etc. Find the Piazza link and guidelines on the Canvas course page.

Topics and Schedule

Hours	Topics
9	**Linear equations.** Gaussian elimination, LU decomposition, condition number. Applications: polynomial interpolation, cubic spline interpolation.
10	**Orthogonality.** Orthogonal subspaces, fundamental subspaces of a matrix, orthogonal projection, Gram-Schmidt orthogonalization, QR decomposition, least squares approximation. Applications: fitting models to data.
11	**Eigenvalues.** Diagonalization, spectral theorem, SVD, pseudoinverse, SVD expansion, power method. Applications: principal component analysis, image deblurring, PageRank.
6	**Discrete Fourier transform.** Complex vector spaces, discrete Fourier transform, sinusoids, frequency and phase. Applications: digital signal processing.
36	

Assessments

We will have:

- **2 Midterm Exams**
- **4 Python Assignments**

- **4 Canvas Quizzes**

- **A Final Exam**

Dates of Python Assignments and Canvas Quizzes will be announced on the course Canvas page.

Breakdown of marks

Canvas Quizzes	$4 \times 2.5\%$ each $= 10\%$
Python Assignments	$4 \times 2.5\%$ each $= 10\%$
Midterm Exams	$2 \times 15\%$ each $= 30\%$
Final Exam	50%

Information on assessments

- Canvas Quizzes: asynchronous; collaboration is allowed. You will have two attempts to complete each quiz.

- Midterm Exams: In person and closed book.

- Python Assignments: no prior Python experience required. There will be a Python lecture on zoom, announced in Canvas.

- Final Exam: In person and closed book.

Missed Assessments

- If you miss a midterm for valid reasons, the weight of the midterm will be passed onto the final.

- If you miss a Canvas Quiz or a Python Assignment, the weight of the missed assessment will be passed on to the remaining assessments of the same type.

- In cases listed above (i.e., when you miss an "in-term" assessment), you must fill in this form and email it to your instructor within 24 hours of the missed asessment.

- For final exams, academic concessions are handled through your Faculty Advising Office. UBC's policies on concessions can be found here.

Please see the course Canvas page for details closer to the date of the exams/assignments.

General Syllabus Information

The Mathematics Department has standard syllabus information. This includes standardised policies for

- academic concessions (i.e., missed assignment, quiz, midterm)

- academic integrity (i.e., cheating)

- registration issues (your instructors have no control over anything to do with registration)

- misc student resources

You can find that information here: https://www.math.ubc.ca/general-syllabus-information

Student Resources

Science Advising	Health and Wellbeing	Centre for Accessibility
Academic Concession (Final Exam)	Academic Integrity	Counselling Services

University Policies

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website.