
MATH 307: Applied Linear Algebra

General Info

- Instructor: Patrick Walls (pwalls@math.ubc.ca)
- Lectures: Monday 2-3pm, Tuesday, Wednesday & Thursday 2-4pm, LSK 201
- Textbook: [Linear Algebra with Applications](#), by Keith Nicholson [KN]
- Pre-requisites: One of MATH 152, MATH 221, MATH 223 and one of MATH 200, MATH 217, MATH 226, MATH 253, MATH 263.

Assessments

MATLAB Assignments	10%	4 assignments \times 2.5% per assignment
Quizzes	10%	4 quizzes \times 2.5% per quiz
Midterm Exam	30%	
Final Exam	50%	

Lecture Schedule

<i>Lecture</i>	<i>Topics</i>	
	Systems of Linear Equations	
1	Solutions, elementary operations and matrices	KN§1.1,1.2,1.3,2.5
2	LU factorization	KN§2.7
3	Vector norms, matrix norms and condition numbers	
4	Application: Lagrange interpolation	KN§3.2
5/6	Application: Cubic spline interpolation	
7/8	Application: Finite difference method	
	Real Vector Spaces	
9	Examples and basic properties	KN§5.1,6.1
10	Subspaces and spanning sets	KN§6.2
11	Linear independence, bases and dimension	KN§5.2,6.3

12/13	Orthogonal subspaces and projections	KN§5.3,8.1,10.1,10.2
14/15	Fundamental subspaces of a matrix	KN§5.4,7.2
16	Application: Least squares polynomial regression	KN§5.6
	Complex Vector Spaces	
17	Complex numbers	KN Appendix A
18	Inner products and unitary matrices	KN§8.7
19/20	Application: Fourier series	KN§10.5
21/22	Application: Fast Fourier transform (FFT)	
	Eigenvalues and Eigenvectors	
23	Definitions, characteristic polynomial and basic properties	KN§3.3
24	Power method	KN§8.5
25	Diagonalization	KN§5.5,8.2
26	Spectral Theorem (hermitian and symmetric matrices)	KN§8.2,8.7
27/28	Singular value decomposition	KN§8.6
29/30	Application: Markov chains (Google PageRank)	
31	Application: Principal component analysis	
32/33	Application: Computer tomography (CT Scanning)	
34/35	Application: Matrix completion (Netflix Problem)	