

# Syllabus for MATH 221.01

## LINEAR ALGEBRA & APPLICATIONS

Last revised: January 18, 2018

**Instructor:** Ákos Nagy

**Website:** [akosnagy.com/teaching.html](http://akosnagy.com/teaching.html)

**Class time:** MWF 8:45am - 9:35am

**Classroom:** 235 Physics Building

**Textbook:** Linear Algebra: A Geometric Approach (2<sup>nd</sup> edition), by Theodore Shifrin and Malcolm R. Adams.

**Assessments and Grade:** There will weekly Homework assignments (15%), 3 in-class Midterms (3x15%), and a Final Exam (40%).

**Other:** For other policies and information regarding, for example, missed work, homework submission, attendance, etc, please visit the class website, or contact me at [akos.nagy@duke.edu](mailto:akos.nagy@duke.edu).

### Class schedule

<i>Class date</i>	<i>Section number</i>	<i>Topic / Homework</i>
1/10	1.1	Vectors HW: pp. 15–18: 6(a,c,g), 7, 8, 11, 25, 29
1/12	1.2	Dot Products HW: pp. 25–28: 1(b,d,g), 4, 9, 11, 13 (no geometric interpretation necessary), 16, 18
1/15	—	Martin Luther King, Jr. Day; no class meeting
1/17	—	CANCELLED.
1/19	1.3	Hyperplanes in $\mathbb{R}^n$ HW: pp. 16–17: 10,21,22,23, pp. 26: 2(b,d,g), pp. 34–35: 1(a,c,f), 3(a,d,e), 8, 12
1/22	1.4	Systems of Linear Equations and Gaussian Elimination, Part 1
1/24	1.4	Systems of Linear Equations and Gaussian Elimination, Part 2 HW: pp. 49–53: 1, 3(a–f), 4(d,f), 10, 11, 13
1/26	1.5	Theory of Linear Systems, Part 1
1/29	1.5	Theory of Linear Systems, Part 2 HW: pp. 61–64: 1, 2(a,b), 3(a,c), 4a, 5b, 6, 10, 12, 13, 14

1/31	1.6	Some Applications HW: pp. 75–77: 3, 5, 7, 9, 11, 12a, 13b
2/2	2.1	Matrix Operations HW: pp. 89–91: 1(a,c,f), 2, 5, 6, 7, 8, 9, 12(a,b,d), 14, 15
2/5	2.2	Linear Transformations HW: pp. 100–102: 5, 7, 8
2/7	2.3	Inverse Matrices HW: pp. 108–110: 1(b,d,f), 2(a,c,d), 4, 8, 11, 12, 16
2/9	2.4	Elementary Matrices HW: pp. 118–119: 3(a,c,d), 7, 14
2/12	2.5	The Transpose HW: pp. 122–124: 1(a,f,j), 4, 8, 9, 12, 15, 19(a,b,c), 22, 23
2/14	3.1	Subspaces of $\mathbb{R}^n$ HW: pp. 134–135: 1, 2(a,c,d), 6, 9(b,c), 10, 12, 13, 14, 17
2/16	3.2	The Four Fundamental Subspaces HW: pp. 142–143: 1, 2(a,b), 5, 10, 11
2/19	—	1 <sup>st</sup> Midterm (Chapter 1 and 2)
2/21	3.3	Linear Independence HW: pp. 154–156: 1, 2, 5(a,b), 8, 10, 11, 14, 15, 19, 21, 22
2/23	3.4	Dimension, Part 1
2/26	3.4	Dimension, Part 2 HW: pp. 167–170: 2, 3(a,b,d), 4, 7, 17, 20, 24
2/28	3.6	Abstract Vector Spaces, Part 1
3/2	3.6	Abstract Vector Spaces, Part 2 HW: pp. 185–188: 1, 2(a,c,d), 3(a,c,f), 4, 6(a,b), 9, 12a, 13, 14(b,c), 15(a,b)
3/5		Complex Vector Spaces, $\mathbb{C}^n$ and related topics
3/7	4.1	Inconsistent Systems and Projection HW: pp. 198–200: 1(a,b), 3, 6, 7, 9, 11, 13, 15
3/9	4.2	Orthogonal Bases, Part 1
3/12	4.2	Orthogonal Bases, Part 2 HW: pp. 206–208: 2(b,c), 3, 6, 7(a,b), 8a, 9a, 11, 12(a,b)
3/14	—	Spring Break; no class meeting.
3/16	—	Spring Break; no class meeting.
3/19	—	Spring Break; no class meeting.
3/21	4.3	The Matrix of a Linear Transformation, Part 1
3/23	4.3	The Matrix of a Linear Transformation, Part 2 HW: pp. 220–224: 3, 7, 9, 12, 16, 18, 19, 20, 21
3/26	4.4	Abstract Linear Transformations HW: pp. 234–237: 2, 5, 7, 8, 11, 21
3/28	5.1	Determinants

			HW: pp. 243–245: 1(a,b,c), 2, 3, 4, 7, 9a, 10, 11
3/30	5.2	Cofactors and Cramer's Rule	HW: pp. 252–255: 1a, 3, 4, 5(a,c,f), 7, 8, 10
4/2	5.3	Signed Area and Volumes	HW: pp. 258–260: 3, 5, 7
4/4	6.1	The Characteristic Polynomial	HW: pp. 268–270: 1(a,b,d,g,h,i,p), 2, 3, 4, 6, 7(a,d), 9, 10, 13(a,b)
4/6	6.2	Diagonalizability	HW: pp. 274–277: 1(a,b,d,g,h,i,p), 2(c,e,f), 4, 7, 8, 11, 12, 13, 15, 17a, 19(a,b)
4/9	—	2 <sup>nd</sup> Midterm (Sections 3.1-5.3)	
4/11	6.3	Applications	HW: pp. 284–285: 1, 2, 3, 8, 11, 12a
4/13	6.4	The Spectral Theorem, Part 1	
4/13	6.4	The Spectral Theorem, Part 2	HW: pp. 294–296: 1(a,d,e,g), 3, 5, 7, 12(a,b,c,d), 14
4/16	7.1	Complex Eigenvalues and Jordan Canonical Form, Part 1	
4/18	7.1	Complex Eigenvalues and Jordan Canonical Form, Part 2	HW: pp. 312-314: 1, 2(a,b,c,e), 4, 5, 7(a,b,c), 8(a,c,e), 14, 16
4/20	7.3	Matrix Exponentials and Differential Equations, Part 1	
4/23	7.3	Matrix Exponentials and Differential Equations, Part 2	HW: pp. 344-347: 1(a,c,d), 2(a,b,d), 4, 5(a,b), 6, 8(only for $n = 3$ ), 9(a,b), 10, 13, 14
4/25	—	3 <sup>rd</sup> Midterm (Sections 6.1-7.3)	
5/4	—	Final Exam; 2pm-5pm	

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