Math 2114 - Introduction to Linear Algebra - Syllabus
Spring 2025

Notes and notations:

(1) Main Text: Linear Algebra by David Poole, 4^{th} edition
(2) Supplementary Text: Elementary Linear Algebra by Ron Larson, 8^{th} edition
(3) Each unit covers (roughly) 2 weeks of class lectures.
(4) Here W and WA denote Written and WebAssign (i.e., online) problems respectively. The W problems can be found in the textbooks. The WA problems can be found in the online question banks of the textbooks.
(5) Here P and L denote the books by Poole and Larson respectively. So P 1.1 means section 1.1 of Poole's book. Similarly, L 4.1 means section 4.1 of Larson's book.
(6) Here PO and LO denote the online question banks of Poole's and Larson's book respectively. So PO 1.1 means section 1.1 of the online question bank of Poole's book. Similarly, LO 2.2 means section 2.2 of the online question bank of Larson's book.
(7) Problems marked with asterisk, i.e., $*$, are available on WebAssign only.
(8) Problems marked with plus, i.e., $+$, are meant only for $\text{col}(A)$.
(9) Problems marked with double plus, i.e., $++$, are meant only for $\text{col}(A)$ and $\text{null}(A)$.

Sections	Topics	Modes	Sources	Problems
Unit 1 : Vectors, Linear Systems, Matrices				
P 1.1	The Geometry and Algebra of Vectors	W	P 1.1	1a, 1d, 18, 19, 21, 22, 23e, 24e
			L 4.1	41, 44
		WA	PO 1.1	2, 3, 7, 9, 12, 13, 15
P 2.1	Introduction to Linear Systems	W	P 2.1	2, 4, 6, 20, 25, 34, 40a
		WA	PO 2.1	11, 14, 15, 21, 24
P 1.2	Length and Angle: The Dot Product	W	P 1.2	8, 14, 17, 55, 60, 61, 63
			L 5.1	75, 76, 83
		WA	PO 1.2	1, 3, 5, 11, 13, 30, 48, 49, 66
P 3.1	Matrix Operations	W	P 3.1	2, 7, 8, 13, 14, 16, 17, 18, 19, 20, 22, 26, 35
			L 2.2	27, 29
		WA	PO 3.1	3, 4, 5, 9, 21, 23, 503*
P 3.2	Matrix Algebra	W	P 3.2	4, 18e, 20, 22, 23, 26
			L 2.2	41, 45, 61, 69
		WA	PO 3.2	3, 24, 36
			LO 2.2	23, 25
Unit 2 : Solving Linear Systems, Span, Linear Independence				
P 2.2	Direct Methods for Solving Linear Systems	W	P 2.1	31
			P 2.2	8, 12, 16, 19, 25, 26, 28, 29, 30, 41, 42
			L 2.1	40, 43, 44, 49, 50
		WA	PO 2.1	28
			PO 2.2	3, 14, 17, 23, 27, 33
			LO 1.2	10, 43, 49
			L 2.1	37, 39, 45, 51
P 2.3	Spanning Sets and Linear Independence	W	P 2.3	2, 4, 8, 10, 12, 14, 18, 19, 23, 24, 26, 28, 42a, 44
			P Ch 2 Review (p134): 1	
			P 3.1	29
		WA	PO 2.3	1, 3, 7, 15, 17, 22, 30
			LO 4.4	3
Exam 1				
Unit 3 : Matrix Inverses, Subspaces, Basis, Dimension				
P 3.3	The Inverse of a Matrix	W	P 3.3	2, 4, 22, 42a, 43a, 52, 53
			P Ch 3 Review (p252): 1a-c, 8, 9	
			L 2.3	19
		WA	PO 3.3	1, 12, 21, 57
			LO 2.3	3, 41, 56

Sections	Topics	Modes	Sources	Problems
P 3.5	Subspaces, Basis, Dimension, and Rank	W	P 3.5	3, 4, 6, 7, 12^{+}, 16, 17^{++}, 19^{++}, 27, 28, 34, 37, 39, 46, 51, 52
			P Ch 3 Review (p252): 1g-h, 13, 14, 17	
				Find a basis for null(A), where $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 0 & 0 \\ 1 & 0 & 1 \end{bmatrix}$.
		WA	PO 3.5	11^{+}, 18^{++}, 29, 30, 35, 36, 38, 41, 42
Unit 4 : Linear Transformations, Markov Chains, Eigenvalues and Eigenvectors				
P 3.6	Introduction to Linear Transformations	W	P 3.6	5, 6, 8, 10, 13, 14, 20, 24, 33, 37, 53, 54
			P Ch 3 Review (p252): 1i-j, 18	
		WA	PO 3.6	2, 9, 12, 21, 32, 51
			LO 6.1	25, 29
L 6.2	Kernel and Range of Linear Transformations	W	L 6.2	48, 50-54, 60a-e
P 3.7	Markov Chains	W	P 3.7	9, 10
			L 2.5	6, 8
		WA	PO 3.7	1, 3, 4
			LO 2.5	1, 4, 7, 12
P App. C	Complex Numbers	W		Given the complex numbers $w = 2 - 2i$ and $z = 1 + i$, calculate $w + z$, $w - z$, w/z, $\lvert w \rvert$, and $\overline{z}$.
P 4.1	Introduction to Eigenvalues and Eigenvectors	W	P 4.1	4, 5, 8, 10, 19, 22, 23, 28, 36, 37, 38
		WA	PO 4.1	3, 6, 12, 14, 21, 24, 27
Exam 2				
Unit 5 : Determinants, Diagonalization				
P 4.2	Determinants	W	P 4.2	1, 8, 12, 27, 47–52, 53, 54
			L 3.3	18
		WA	LO 3.1	19, 21, 48
			LO 3.2	46, 502*
			LO 3.3	33, 39, 72
P 4.3	Eigenvalues and Eigenvectors of $n \times n$ Matrices	W	P 4.3	2, 4, 7, 8, 10, 15, 16, 17, 18 22, 23
		WA	P 4.3	3, 5, 6
			L 7.1	41
P 4.4	Similarity and Diagonalization	W	P 4.4	18, 25, 28, 38
				Use your work from P 4.3: 2, 4, 7, 8, 10 to determine whether A is diagonalizable and if so, give an invertible matrix P and a diagonal matrix D such that $P^{-1}AP = D$.
		WA	P 4.4	6, 11, 24, 503*, 504*
Unit 6 : Orthogonality, Least Squares				
P 5.1	Orthogonality in $\mathbb{R}^n$	W	P 5.1	2, 6, 7, 8, 10, 13
			L 5.3	11, 12
		WA	PO 5.1	3, 9, 11
			LO 5.1	75, 77
			LO 5.3	6, 10
P 5.2	Orthogonal Complements and Orthogonal Projections	W	P 5.2	4, 10, 11, 16, 18
		WA	PO 5.2	6, 9, 12, 15, 17, 21, 504*
P 5.3	The Gram-Schmidt Process and Orthogonal Basis	W	P 5.3	3, 8, 10
			P Ch 5 Review (p425): 17	
		WA	P 5.3	5, 6, 7, 9
P 7.3	Least Squares	W	P 7.3	4, 8, 20, 22, 30
		WA	P 7.3	1, 3, 6, 7, 19, 36
Exam 3				