

642:550 Linear Algebra and Applications

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Text: Gilbert Strang, *Linear Algebra and its Applications*, 3rd ed.,

ISBN #0-15-551005-3, Saunders Publishing/Harcourt Brace Jovanovich

Date	Lecture	Reading	Topics
9/3	1	1.1-1.4	Linear equations; Matrix algebra
			MatLab Assignment # 1 (due 9/17)
9/8	2	1.5	Triangular, Diagonal, Permutation matrices; Gaussian elimination by matrix multiplication
9/10	3	1.6	<i>LU</i> and <i>LDU</i> factorizations; echelon form
9/15	4	2.1, 2.2	Vector spaces & subspaces; solving $m \times n$ system
9/17	5	2.3	Linear independence; dimension
9/22	6	2.4, 2.6	Column space & null space; rank & nullity
			Matlab Assignment #2 (due 10/6)
9/24	7	3.2	Inner products & projections
9/29	8	3.3	Least squares approximations
10/1	9	3.4	Orthonormal bases; Gram-Schmidt process; <i>QR</i> factorization
10/6	10	5.5	Complex matrices; hermitian geometry;
		3.5	Discrete Fourier Transform
10/8	11	3.5	Fast Fourier transform
			Matlab Assignment #3 (due 10/22)
10/13	12	3.1, 3.6	Linear Transformations; General vector spaces
10/15	13	4.1, 4.2	Properties of determinant function
10/20	14	4.2, 4.3	Formulas for determinants; permutations
10/22	15	4.4	Determinant formulas for inverses; Cramer's rule
10/27	16		Midterm Exam (closed book) on Chapters 1-3
10/29	17	5.1, 5.2	Eigenvalues & eigenvectors; Diagonalization
			Matlab Assignment #4 (due 11/12)
11/3	18	5.3, 5.4	Difference and Differential Equations
11/5	19	5.4, 5.5	Matrix exponentials; Hermitian & Unitary matrices
11/10	20	5.6	Schur Triangular form, Diagonalization of Hermitian matrices
11/12	21	5.6	Normal matrices, Circulant Matrices, Hamilton-Cayley theorem
11/17	22	App. B	Similarity of Matrices; Jordan Canonical Form
			Matlab Assignment # 5 (due 12/8)
11/19	23	App. B	Proof of Jordan Canonical Form; Application to Differential Equations
11/24	24	6.1, 6.2	Quadratic forms; Positive-definite matrices
12/1	25	6.3	Cholesky decomposition; Indefinite quadratic forms & Law of Inertia
12/3	26	App. A	Singular value decomposition
12/8	27	App. A	Applications of Singular Value Decomposition
12/10	28	7.3	Hessenberg form & QR algorithm

Final Exam (closed book)

OVER

Suggested Problem List for 642:550 Applied Linear Algebra

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Section	Suggested problems (especially *problems)
1.2	3, 8, 9, 10
1.3	1, 2*, 3, 4, 8, 12, 13
1.4	2, 3, 6, 8, 10, 11, 14*, 15, 17*, 19, 22, 24
1.5	4, 5*, 9, 11*, 13, 15*, 16, 19
1.6	1, 2, 5*, 6*, 7, 11*, 12, 14, 15, 21*, 22*, 23*
1.7	2, 3, 4, 6, 7
Chapter 1 Review:	4*, 5*, 12*, 13*, 18*, 27*, 28*, 29*
2.1	2*, 5*, 6, 8
2.2	3*, 4, 6*, 7, 8, 10*, 12
2.3	1*, 2, 3, 4*, 6, 8, 9, 10, 12*, 16, 17, 18*, 22*, 23*
2.4	1*, 2*, 4, 5*, 6*, 8, 9, 11, 12, 14*, 15, 17, 19*, 20*, 21*
2.6	1, 2, 4, 6, 8, 9, 16, 19
Chapter 2 Review:	1*, 2*, 3*, 4*, 11*, 12*, 22*, 30*, 33*
3.1	1, 2, 3, 4, 5, 6*, 7, 8*, 9*, 11, 12, 14, 16, 17, 18, 19*, 20*, 22
3.2	1, 2, 3, 4, 5, 8, 9, 10, 11*, 13, 15*
3.3	1, 3*, 5, 7*, 11, 12*, 15, 16, 18, 19*, 25*
3.4	2*, 3*, 4, 5, 6, 11, 13*, 15, 16*, 17*
3.5	1, 2, 3, 4, 7, 8, 11, 13
3.6	10*, 11*, 12*, 13*
Chapter 3 Review:	2*, 9*, 18*, 20*, 27*, 33*, 34*, 39*, 40*
4.2	1, 4, 6, 7, 9, 10, 11, 12, 13*, 14*, 17
4.3	1, 3, 5*, 6*, 9, 13*
4.4	3, 5, 6, 8, 12, 13, 14, 15, 16
Chapter 4 Review:	3*, 4, 5, 6*, 8*, 9, 13, 15, 21
5.1	1*, 2, 4, 7, 8, 9, 12, 13*, 14*, 15, 17*, 18
5.2	1, 2, 3, 4, 5*, 6*, 7*, 8, 10, 11, 13, 14
5.3	1, 2, 3*, 5, 9, 12
5.4	1*, 2*, 3, 4*, 5*, 12*
5.5	Lecture 10: 1, 2, 3, 4, 5, 6, 7, 8, 17*, 18, 19* Lectures 19-21: 10, 11, 12*, 13*, 14, 15, 20, 22, 23*, 24*
5.6	1, 2, 3*, 4, 5*, 6, 13, 15, 16*, 17, 18, 20, 21*, 22*, 23*, 25, 27*, 30*, 31
Chapter 5 Review:	3*, 4*, 5, 8*, 11*, 15*, 19*, 20*
6.1	1, 2, 5*, 7, 13*
6.2	2*, 3, 4*, 5, 7*, 8, 9, 16*, 18
6.3	1, 2*, 3, 5*, 11*
7.3	3*, 4, 5*, 7, 9*
App. A	2*, 4, 5*, 6*, 9, 10*
App. B	1*, 3, 4, 5*, 6*