

MATH 550 Linear Algebra

DESCRIPTION

Basic properties of vector spaces and linear transformations, algebra of polynomials, characteristic values and diagonalizable operators, invariant subspaces and triangulable operators. The primary decomposition theorem, cyclic decompositions and the generalized Cayley-Hamilton theorem. Rational and Jordan forms, inner product spaces. The spectral theorem, bilinear forms, symmetric and skew symmetric bilinear forms. **PREREQUISITE:** Math 225

TEXTBOOKS

[HK] Linear Algebra, by K. Hoffman – R. Kunze, Second Edition.

[A] Linear Algebra Done Right, by S. Axler, Third Edition.

SYLLABUS

Week	Dates (2019)	Sections	Topics
1	Sept 01 – 05	1.1, 2.1, 2.2 2.3	Fields, VECTOR SPACES. Subspaces (Review) Bases and Dimension
2	Sept 08 – 12	2.4 3.1	Coordinates LINEAR TRANSFORMATIONS.
3	Sept 15 – 19	3.2-3.3 3.4	The Algebra of Linear Transformations, Isomorphisms Representation of Transformations by Matrices
4	Sept 22 – 26	3.5 3.6-3.7	Linear Functionals The Double Dual, The Transpose of a Linear Transformation
5	Sept 29 – Oct 03	6.1-6.2 6.3	ELEMENTARY CANONICAL FORMS. Characteristic Values Annihilating Polynomials
Major Exam 1			
6	Oct 06 – 10	6.4 6.5-6.6	Invariant Subspaces Simultaneous Triangulation/Diagonalization, Direct-Sum Decomposition
7	Oct 13 – 17	6.7-6.8	Invariant Direct Sums, The Primary Decomposition Theorem
8	Oct 20 – 24	7.1-7.2	THE RATIONAL AND JORDAN FORMS. Cyclic Subspaces and Annihilators, Cyclic Decompositions and the Rational Form
9	Oct 27 – 31	7.3 7.4	The Jordan Form Computation of Invariant Factors
10	Nov 03 – 07	7.5	Summary, Semi-simple Operators
Major Exam 2			
11	Nov 10 – 14	8.1-8.2	INNER PRODUCT SPACES. Inner Products, Inner Product Spaces
12	Nov 17 – 21	8.3 8.4	Linear Functionals and Adjoint Unitary Operators
13	Nov 24 – 28	8.5 9.5	Normal Operators Spectral Theory
14	Dec 01 – 05	10.1 10.2	BILINEAR FORMS Symmetric Bilinear Forms
15	Dec 08 – 12	10.3	Skew-Symmetric Bilinear Forms
Final Exam			

HOMEWORK

Week	Dates (2018)	Lectures	Homework	
			Problems [HK]	Examples [A]
1	Sept 01 – 05	1.1, 2.1, 2.2 2.3	1.2-7, 8, 2.2-9 + 2.2-5 6, 7, 8, 11, 14	1.33, 1.35, 1.43 2.6, 2.14, 2.16, 2.28, 2.40, 2.41 3.4, 3.10, 3.13, 3.18, 3.25, 3.27, 3.33, 3.34, 3.57, 3.68, 3.70, 3.75, 3.93, 3.100, 3.103, 3.104, 3.116
2	Sept 08 – 12	2.4 3.1	1, 2, 4, 5, 6 + Examples 19, 20 + 2.5-6 12, 13	
3	Sept 15 – 19	3.2-3.3 3.4	3.2-11, 12 + Extras 12, 13 + Examples 16, 17	
4	Sept 22 – 26	3.5 3.6-3.7	12 , 13, 15, 17 + Examples 23, 24 + Corol. 1, 2 3.6-1 + Corol. 2 + Proof of Theorem 23	
5	Sept 29 – Oct 03	6.1-6.2 6.3	6.2-8, 9, 11, 12, 15 + Examples 1, 2, 3 1, 2 , 10, 11 + Min. Poly. Examples 1, 2, 3 in 6.2	
Exam 1				
6	Oct 06 – 10	6.4 6.5-6.6	11 + Examples 7, 8, 10 6.5-1 , 5 + Proof of Theorem 8 + Extra	8.7, 8.12, 8.17, 8.28, 8.30 8.53, 8.54
7	Oct 13 – 17	6.7-6.8	Proof of Theorem 13	
8	Oct 20 – 24	7.1-7.2	7.1-3 + Proof of Theorem 4 + Extras	
9	Oct 27 – 31	7.3 7.4	8 + Examples 5, 6 + Extra 3 + Extra	
10	Nov 03 – 07	7.5	[Summary → Theorem 13 (w/o proof)]	
Exam 2				
11	Nov 10 – 14	8.1-8.2	Examples 8, 9, 10, 11, 12, 13, 14 + 8.2-16	6.4, 6.9, 6.17, 6.29, 6.33, 6.40, 6.44, 6.58 7.3, 7.4, 7.12, 7.19, 7.23, 7.30
12	Nov 17 – 21	8.3 8.4	11 + Examples 16, 17, 19, 20 Examples 23, 24, 27, 28 + Extras	
13	Nov 24 – 28	8.5 9.5	Extras [Lecture]	
14	Dec 01 – 05	10.1 10.2	12, 14 + Examples 1, 4, 5 1, 6 , 17	
15	Dec 08 – 12	10.3	9	
Final				