

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 280

TEXTBOOKS

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

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

SYLLABUS

| Week | Dates (2018) | Sections | Topics |
|---------------------|------------------|----------------------|--|
| 1 | Sept 02 – 06 | 1.1, 2.1, 2.2 2.3 | Fields, VECTOR SPACES. Subspaces (Review) Bases and Dimension |
| 2 | Sept 09 – 13 | 2.4 3.1 | Coordinates LINEAR TRANSFORMATIONS. |
| 3 | Sept 16 – 20 | 3.2-3.3 3.4 | The Algebra of Linear Transformations, Isomorphisms Representation of Transformations by Matrices |
| 4 | Sept 24 – 29 | 3.5 3.6-3.7 | Linear Functionals The Double Dual, The Transpose of a Linear Transformation |
| 5 | Sept 30 – Oct 04 | 6.1-6.2 6.3 | ELEMENTARY CANONICAL FORMS. Characteristic Values Annihilating Polynomials |
| Major Exam 1 | | | |
| 6 | Oct 07 – 11 | 6.4 6.5-6.6 | Invariant Subspaces Simultaneous Triangulation/Diagonalization, Direct-Sum Decomposition |
| 7 | Oct 14 – 18 | 6.7-6.8 | Invariant Direct Sums, The Primary Decomposition Theorem |
| 8 | Oct 21 – 25 | 7.1-7.2 | THE RATIONAL AND JORDAN FORMS. Cyclic Subspaces and Annihilators, Cyclic Decompositions and the Rational Form |
| 9 | Oct 28 – Nov 01 | 7.3 7.4 | The Jordan Form Computation of Invariant Factors |
| 10 | Nov 04 – 08 | 7.5 | Summary, Semi-simple Operators |
| Major Exam 2 | | | |
| 11 | Nov 11 – 15 | 8.1-8.2 | INNER PRODUCT SPACES. Inner Products, Inner Product Spaces |
| 12 | Nov 18 – 22 | 8.3 8.4 | Linear Functionals and Adjoint Unitary Operators |
| 13 | Nov 25 – 29 | 8.5 9.5 | Normal Operators Spectral Theory |
| 14 | Dec 02 – 06 | 10.1 10.2 | BILINEAR FORMS Symmetric Bilinear Forms |
| 15 | Dec 09 – 13 | 10.3 | Skew-Symmetric Bilinear Forms |
| Final Exam | | | |