

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

Department of Mathematics & Statistics

MATH550- Linear Algebra

Course Syllabus

Instructor:

Dr. Manal Alotibi

Contact: manal.alotibi@kfupm.edu.sa

Office hours:

Sunday and Tuesday, 10:00 am -13:00 pm (or set an appointment if needed)

Course 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

Textbook:

(HK) Linear Algebra, by K. Hoffman R. Kunze, Second Edition.

(A) Linear Algebra Done Right, by S. Axler, Third Edition.

Grading Policy:

- Exam 1 25%
- Exam 2: 25%
- Homework and other Assignments: 20%
- Final Exam 30% (Comprehensive; Date and Location: To Be Announced)

Homework Policy:

Homework should be submitted by e-mail (pdf format) by the midnight of the due date. Each late submission will be penalized by 5%. Use the following subject line to submit your homework:

MATH 550 HOMEWORK [NUMBER] - [NAME - KFUPM STUDENT ID]

In case you do not use the above format, I might miss your submission and you might be penalized for late submission.

Attendance Policy:

Attendance is a University Requirement. If you miss 9 or more classes without an official excuse, you will be given a DN grade.

Topics

Week	Sections	Recommended Exercises
1	1.1 Fields 2.1 Vector Spaces 2.2 Subspaces 2.3 Bases and Dimensions	7, 8 5,9 6, 7, 8, 11, 14
2	2.4 Coordinates 3.1 Linear Transformations	1, 2, 3, 4, 5, 6, Ex19, 20 12, 13

3	3.2 The Algebra of Linear Transformations 3.3 Isomorphism 3.4 Representation of Transformations by Matrices	11, 12 12, 13, Ex 16 & 17
4	3.5 Linear functionals 3.6 The Double Dual 3.7 The Transpose of a Linear Transformation	12,13,15,17, Ex 23, 24 1, Proof of Thm 23
5	6.1 Introduction 6.2 Characteristic Values 6.3 Annihilating Polynomials	8,9,11,12,15, Ex 1, 2, 3 1,2,10,11,
6	6.4 Invariant Subspaces 6.5 Simultaneous Triangulation; Simultaneous Diagonalization 6.6 Direct-Sum decompositions	11, Ex 7, 8, 10 1, 5, Proof of Thm. 8
7	6.7 Invariant Direct Sums 6.8 The Primary Decomposition Theorem	Proof of Thm. 13
8	7.1 Cyclic Subspaces and Annihilators 7.2 Cyclic Decompositions and the Rational Form	3, Proof of Thm. 4
9	7.3 The Jordan Form 7.4 Computation of Invariant Factors	8, Ex 5, 6 3
10	7.5 Summary; Semi-Simple Operators	Proof of Thm. 13
11	8.1 Inner Products 8.2 Inner Product Spaces	Ex 8, 9, 10, 11, 12, 13, 14 16
12	8.3 Linear Functionals and Adjoints 8.4 Unitary Operators	11, Ex 16, 17, 19, 20 Ex 23, 24, 27, 28
13	8.5 Normal Operators 9.5 Spectral Theory	
14	10.1 Bilinear Forms 10.2 Symmetric Bilinear Forms	12, 14, Ex 1, 4, 5 1, 6, 17
15	10.3 Skew-Symmetric Bilinear Forms	9

Recommended Reading:

The following table shows the mapping of the chapters between the two recommended textbooks and the list of recommended reading material in the textbook (A):

Chapters of (HK)	Chapters of (A)	Examples in (A)
1,2,3	1,2,3	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
6,7	5,8,9	5.3, 5.8, 5.15, 5.18, 5.23, 5.33, 5.37, 5.40, 5.43, 5.45, 8.7, 8.12, 8.17, 8.25, 8.28, 8.30, 8.35, 8.45, 8.50, 8.51, 8.53, 8.54, 9.18, 9.22, 9.25
8,9,10	6,7	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