King Fahd University of Petroleum & Minerals

Department of Mathematics and Statistics

Syllabus of Math 325 (211)

(Course Instructor: Dr. A. Mimouni; Office: 5-303; Tel: 4036; email: amimoui@kfupm.edu.sa)

Course: Math 325

Title: Linear Algebra

Textbook: *Serge Lang, Linear Algebra, 3rd Edition (Springer), 1987.*

Description: Theory of vector spaces and linear transformations. Direct sums. Inner product spaces. The dual space. Bilinear forms. Polynomials and matrices. Triangulation of matrices and linear transformations. Hamilton-Cayley theorem.

Prerequisite: Math 225

Week	Date	Section	Material	Homework Problems
1	Aug29-Sep02	1.1 1.2	**Vector spaces**: Definitions Basis	2, 4, 8b, 9b, 10, 12 1g, 5b, 5f, 10
2	Sep 05-09	1.3 1.4	Dimension of a vector space Sums and Direct Sums	 1, 2
3	Sep 12-16	3.2 3.3	**Linear Mappings**: Linear Mappings The Kernel and Image of a Linear Map	1c, 1e, 1f, 1g, 3, 5, 15, 18b 2, 5, 12, 14, 17, 18
4	Sep 19-22	3.4 4.1	Composition and Inverse of Linear mappings **Linear Maps and Matrices**: Linear Map Associated with a Matrix	2, 7, 10, 17, 19 1(a), 1(d)
5	Sep 26-30	4.2 5.1	Matrix Associated with a Linear Map **Scalar Products and Orthogonality** Scalar Products	1d, 1f, 6, 8, 9 1, 2, 3
6	Oct 03-07	5.2 5.4	Orthogonal Bases, Positive Definite Case Bilinear Maps and Matrices	2b, 5, 6a, 9, 10 1, 2, 5b, 5e, 6
Major Exam 1, October 07, 2019. Material: Section 1.1 up to Section 4.2				
7	Oct 10-14	5.5 5.6	General Orthogonal Bases The Dual Space and Scalar Products	1a, 1b, 3 1, 3, 4, 6
8	Oct 18-21	5.7 5.8	Quadratic Forms Sylvester's Theorem	2, 3a, 3b, 3c, 3d, 4 1a, 1c, 3a, 3b
9	Oct 24-28	 7.1 7.2	**Symmetric, Hermitian, and Unitary Operators**: Symmetric Operators Hermitian Operators	 1, 6, 8, 15 1, 5, 7, 11
10	Oct 31- Nov.04	7.3 8.1	Unitary Operators **Eigenvectors and Eigenvalues** Eigenvalues and Eigenvectors	1, 2, 3, 6 1, 3, 4, 7
11	Nov 07-11	8.2 8.3	The Characteristic Polynomial Eigenvalues and Eigenvectors of Symmetric Matrices	8a, 8d, 9, 10, 14
Major Exam 2, November 11, 2019. Material: Section 5.1 up to Section 7.3				
12	Nov 14-18	8.4 8.5	Diagonalization of a Symmetric Linear Map The Hermitian Case	1, 2, 3, 11, 18, 19 1, 3, 6, 10
13	Nov 21- 25	8.6 9.1	Unitary Operators **Polynomials and Matrices** Polynomials	2,3,4,6,8,13 2,5,8,10,11,15,16,18
14	Dec 05-09	9.2 10.1	Polynomials of Matrices and Linear Maps **Triangulation of Matrices and Linear Maps** Existence of Triangulation	1, 2, 3, 4, 5 1, 2, 5, 7
15	Dec 12-16	10.2	Theorem of Hamilton-Cayley	
16	Dec19-20		Catch-up	

Exams and Distribution of Marks:

Exam I (25%): Material: From Section 1.1 To Section 4.2, Monday, October 07, 2021
Exam II (25%): Material: From Section 5.1 To Section 7.3, Monday, November 11, 2021
Homework (10%): Homework to be submitted every Sunday.

Time for exams will be discussed

Final Exam 40% (Comprehensive): The time and place of the Final Exam will be determined by the Office of the Registrar.

The DN Grade: According to the university regulation