Universidad Carlos III de Madrid
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COURSE: LINEAR ALGEBRA		
DEGREE: Aerospace Engineering	YEAR: 1	TERM: 1

WEEK	SESSION 45, 46 & 47	DESCRIPTION	GROUP		WEEKLY PROGRAMMING FOR STUDENTS		
			LECTURE	SEMINAR	NOTES	LECTURE HOURS	STUDENT WORK
1	5/9 & 6/9	**0. Complex Numbers** **0.1 First operations** • Definition. Binomial form • Sum and product • Graphical representation **0.2 Further operations** • **C**onjugate, modulus and argument • Division		X	Book study, Appendix A [N]	1,66	6
2	10/9	**0.2 Exponential form** • Exponential form • Roots of a complex number	X		Book study, Appendix A [N]	1,66	6
2	12/9 & 13/9	Selected exercises (*)		X	Additional exercises from collection and textbooks (*)	1,66	
3	17/9	**1. Systems of linear equations** **1.1 Solving linear equations** • Matrix notation • Gaussian elimination **1.2 Row reduction and echelon forms** • Uniqueness • Solutions of linear systems		X	Book study, chapters 1.1-1.2 [L]	1,66	6
3	19/9 & 20/9	Selected exercises (*)		X	Additional exercises from collection and textbooks (*)	1,66	
4	24/9	**1.3 Vector equations** • Vectors and linear combinations • Subset spanned by vectors **1.4 The matrix equation Ax=b** • Matrix times vector • Solutions of a SLE	X		Book study, chapters 1.3-1.5 [L]	1,66	6
4	26/9 & 27/9	Selected exercises (*)		X	Additional exercises from collection and textbooks (*)	1,66	

5	1/10	**2. Matrices** **2.1 Matrix Operations** • Sum and product by scalars • Product • Transpose of a matrix **2.2 Inverse of a matrix** • Relation with the unioqueness of Ax=b • Computation	X		Book study, chapters 2.1-2.3 [L]	1,66	6
5	3/10 & 4/10	Selected exercises (*)		X	Additional exercises from collection and textbooks (*)	1,66	
6	8/10	**3. Vector spaces** **3.1 Vector Spaces and Subspaces** • Sub-spaced generated by vectors • Null Space and Columns space	X		Book study, chapters 2.8, 4.1-4.2 de [L]	1,66	6
6	10/10 & 10/10	**Midterm test on chapters 0, 1 and 2** Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	
7	15/10	**3.2 Linear Independence and basis** • The spanning set theorem • Basis for Nul(A) and Col(A)	X		Book study, chapters 1.7, 2.9, 4.3 [L]	1,66	
7	17/10 & 18/10	Selected exercises (*)		X	Additional exercises from collection and textbooks (*)	1,66	
8	22/10	**3.3 Coordinate Systems** **3.4 The dimension of a vector space** • The basis theorem • The dimensions of Nul(A) and Col(A)	X		Book study, chapters 4.4-4.5 [L]	1,66	6
8	24/10 & 25/10	Selected exercises (*)		X	Additional exercises from collection and textbooks (*)	1,66	
9	29/10	**3.5 Rank** • The Rank theorem **3.6 Change of basis**			Book study, chapters 2.9, 4.6-4.7 [L]		
9	31/10 & 31/10	Selected exercises (*)		X	Additional exercises from collection and textbooks (*)	1,66	
10	5/11	**3.7 Linear transformations** • The matrix of a linear transformation • Kernel and range of a linear transformation	X		Book study, chapters 1.8-1.9 [L]	1,66	6
10	7/11 & 8/11	Selected exercises (*)		X	Additional exercises from collection and textbooks (*)	1,66	
11	12/11	**4. Eigenvalues and eigenvectors** **4.1 Definitions** • Revisiting determinants • Linear Independence of eigenvectores • Eigenspaces **4.2 The characteristic equation**	X		Book study, chapters 3.1 -3.2, 5.1-5.2 [L]	1,66	6
11	14/11 & 15/11	Selected exercises (*)		X	Additional exercises from collection and textbooks (*)	1,66	
12	19/11	**4.3 Diagonalization** • The diagonalization theorem • Diagonalizating matrices	X		Book study, chapter 5-3 [L]	1,66	

12	21/11 & 22/11	Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	
13	26/11	**5. Orthogonality** **5.1 Inner product, length and orthogonality** **5.2 Orthogonal sets** • Orthogonal and orthonormal basis • Orthogonal matrices	X		Book study, chapters 6.1-6.2 [L]	1,66	6
13	28/11 & 29/11	**Midterm test on chapters 3 and 4** Selected exercises (*)		X	Additional exercises from collection and textbooks (*)	1,66	
14	3/12	**5.3 Orthogonal projection** • The best approximation theorem **5.4 The Gram-Schmidt process**	X		Book study, chapters 6.3-6.4 [L]	1,66	6
14	5/12 & 5/12	Selected exercises (*)		X	Additional exercises from collection and textbooks (*)	1,66	
15	10/12	**5.5 Least square problems** • Normal equations **6. Diagonalization of symmetric matrices** • Th spectral theorem	X		Book study, chapter 6.5 [L] and	1,66	6
15	12/12 & 13/12	Selected exercises (*)		X	Additional exercises from collection and textbooks (*)	1,66	6
					Subtotal 1	**50**	**90**
					Total 1 *(Hours of class plus student homework hours between weeks 1-15)*	**140**	
16 - 18		Assessment, evaluation preparation. Final Test				3	7
					Subtotal 2	**3**	**7**
					Total 2 *(Hours of class plus student homework hours between weeks 16-18)*	**10**	
TOTAL *(Total 1 + Total 2)*							**150**

(*) Discussion of selected exercises from the course collection and from the recommended textbooks (W.K. Nicholson's ([N]) or D. C. Lay's ([L])) related with the theory session of the week. Compare with the solutions in the book