



COURSE: LINEAR ALGEBRA		
DEGREE: Biomedical Engineering	YEAR: 1	TERM: 1

WEEK	SESSION	DESCRIPTION	GROUP		WEEKLY PROGRAMMING FOR STUDENTS		
			LECTURE	SEMINAR	NOTES	LECTURE HOURS	STUDENT WORK
1	1	1. Complex Numbers 1.1 First operations <ul style="list-style-type: none"> • Definition. Binomial form • Sum and product • Graphical representation 1.2 Further operations <ul style="list-style-type: none"> • Conjugate, modulus and argument • Division 		X	Book study, Appendix A [N]	1,66	6
2	2	1.2 Exponential form <ul style="list-style-type: none"> • Euler's formula • Roots of a complex number 	X		Book study, Appendix A [N]	1,66	6
2	3	Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	
3	4	2. Systems of linear equations 2.1 Solving linear equations <ul style="list-style-type: none"> • Matrix notation • Gaussian elimination 2.2 Row reduction and echelon forms <ul style="list-style-type: none"> • Uniqueness • Solutions of linear systems 		X	Book study, chapters 1.1-1.2 [L]	1,66	6
3	5	Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	
4	6	2.3 Vector equations <ul style="list-style-type: none"> • Vectors and linear combinations • Subset spanned by vectors 2.4 The matrix equation $Ax=b$ <ul style="list-style-type: none"> • Matrix times vector • Solutions of a SLE 	X		Book study, chapters 1.3-1.5 [L]	1,66	6
4	7	Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	

5	8	3. Matrices 3.1 Matrix Operations <ul style="list-style-type: none"> • Sum and product by scalars • Product • Transpose of a matrix 3.2 Inverse of a matrix <ul style="list-style-type: none"> • Relation with the uniqueness of $Ax=b$ • Computation 	X		Book study, chapters 2.1-2.3 [L]	1,66	6
5	9	Midterm test on chapters 1 and 2 Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	
6	10	4. Vector spaces 4.1 Vector Spaces and Subspaces <ul style="list-style-type: none"> • Subspace generated by vectors • Null Space and Column space 	X		Book study, chapters 2.8, 4.1-4.2 de [L]	1,66	6
6	11	Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	
7	12	4.2 Linear Independence and bases <ul style="list-style-type: none"> • 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	13	Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	
8	14	4.3 Coordinate Systems 4.4 The dimension of a vector space <ul style="list-style-type: none"> • The basis theorem • The dimensions of $Nul(A)$ and $Col(A)$ 	X		Book study, chapters 4.4-4.5 [L]	1,66	6
8	15	Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	
9	16	4.5 Rank <ul style="list-style-type: none"> • The Rank theorem 4.6 Change of basis			Book study, chapters 2.9, 4.6-4.7 [L]		
9	17	Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	
10	18	4.7 Linear transformations <ul style="list-style-type: none"> • 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	19	Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	
11	20	5. Eigenvalues and eigenvectors 5.1 Definitions <ul style="list-style-type: none"> • Revisiting determinants • Linear Independence of eigenvectors • Eigenspaces 5.2 The characteristic equation	X		Book study, chapters 3.1 -3.2, 5.1-5.2 [L]	1,66	6
11	21	5.3 Diagonalization <ul style="list-style-type: none"> • The diagonalization theorem • Diagonalizing matrices 	X		Book study, chapter 5-3 [L]	1,66	
11	22	Midterm test on Chapters 3 and 4 Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	

12	23	6. Orthogonality 6.1 Inner product, length and orthogonality 6.2 Orthogonal sets <ul style="list-style-type: none"> • Orthogonal and orthonormal bases • Orthogonal matrices 	X		Book study, chapters 6.1-6.2 [L]	1,66	6
12	24	Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	
13	25	6.3 Orthogonal projection <ul style="list-style-type: none"> • The best approximation theorem 6.4 The Gram-Schmidt process	X		Book study, chapters 6.3-6.4 [L]	1,66	6
13	26	Selected exercises		X	Odd numbered exercises. Compare with solutions (*)	1,66	
14	27	6.5 Least squares problems <ul style="list-style-type: none"> • Normal equations 	X		Book study, chapter 6.5 [L]	1,66	6
14	28	Selected exercises	X		Odd numbered exercises. Compare with solutions (*)	1,66	
15	29	7. Diagonalization of symmetric matrices <ul style="list-style-type: none"> • The spectral theorem 		X	Book study, chapter 7.1 [L]	1,66	6
15	30	Midterm test on Chapters 5 and 6				1,66	
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

(*) Do some of the recommended exercises in W.K. Nicholson's ([N]) or D. C. Lay's ([L]) book corresponding to the previous lecture in large group and compare with the solutions in the book