

Detailed Course Description - Course Plan Development and Updating Procedures/ Department	QF01/0408-3.0E
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Faculty	Science & Information Technology	Department	Mathematics
Course number	0101321	Course title	Linear Algebra I
Number of credit hours	3	Pre-requisite/co-requisite	Calculus 1 (0120121)

Brief course description

Matrices And Operation On Matrices, Determinants, Matrix Form Of Linear Systems, Euclidean Vector Space, Subspaces, Dimension, Rank, Linear Transformations From \mathbb{R}^n To \mathbb{R}^m , Eigenvalues And Eigenvectors, Characteristic Polynomial, Cayley-Hamilton Theory, Eigenvalues And Eigenvectors Of Hermitian And unitary Matrices

Course goals and learning outcomes	
Goal 1	Learn to solve systems of linear equations and application problems requiring them
Learning outcomes	1.1: Determine if a system of linear equations has a solution. 1.2: Interpret the meaning of the solution set of a system of linear equations. 1.3: Solve application problems that can be modeled by systems of linear equations.
Goal 2	Work with matrices and determine if a given square matrix is invertible
Learning outcomes	2.1: Perform matrix operations. 2.2: Use row operations to determine if a square matrix is invertible. 2.3: Find the inverse of a square matrix.
Goal 3	Learn to compute determinants and know their properties.
Learning outcomes	3.1: Compute the determinant of a square matrix by using the definition and by using the properties of determinants. 3.2: Find the determinant of a product of square matrices, of the transpose of a square matrix, and of the inverse of an invertible matrix. 3.3: Students will demonstrate competence with the basic ideas of determinants.
Goal 4	Learn about and work with vector spaces and subspaces.
Learning outcomes	4.1: Use the definition of vector space to determine if a given set of vectors is a vector space 4.2: Determine if a subset of a vector space is a subspace. 4.3: Determine if a given set of vectors is a basis for a vector space. 4.4: Determine the dimension of a subspace.
Textbook	Elementary Linear Algebra by Howard Anton, 8 th Edition. Publisher :John Wiley and Sons

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Supplementary references	<p>1- Linear Algebra and its Applications; David C. Lay ; Addison-Wesley; 2006 2- Elementary Linear Algebra; B. Kolman & D. Hill; Prentice-Hall; 2004 3- Linear Algebra with Applications; Steven J. Leon; Prentice-Hall; 2006 4- Linear Algebra; An introduction. Larson; 2006.</p>
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Course timeline

Week	Number of hours	Course topics	Pages (textbook)	Notes
01	1	Introduction to systems of linear equations	2 – 5	
	1	Gaussian elimination	8 – 16	
	1	Homogeneous systems	16 – 19	
02	1	Matrices	23 – 25	
	1	Matrix operations	25 – 33	
	1	Rules of matrix arithmetic	37 – 41	
03	1	Inverses	41 – 47	
	1	Elementary matrices	50 – 53	
	1	Method for finding A^{-1}	54 – 56	
04	1	Further results on systems of equations and invertibility	59 – 61	
	1	Diagonal and triangular matrices	66 – 69	
	1	Symmetric matrices	69 – 71	
05	1	The determinant function	82 – 87	
	1	Evaluating determinants by row reduction	89 – 93	
	1	Evaluating determinants by column reduction	93 – 94	
06	1	Properties of the determinant function	95 – 96	
	1	Determinant of a matrix product	97 – 101	
	1	Determinant test for invertibility		
07	1	Minors and cofactors	104 – 105	
	1	Cofactor Expansion	105 – 107	
	1	Adjoint of a matrix	107 – 109	
08	1	Inverse of a matrix using its adjoint	109 - 110	
	1	Cramer's rule	111 – 112	
	1	Applications of determinants	112 – 114	
09	1	Real Vector Spaces	162 – 163	
	1	Euclidean n-space	163 – 170	
	1	Some properties of vectors		
10	1	Subspaces	211 – 214	
	1	Solution spaces of homogeneous systems	214 – 215	
	1	Linear combination	215 – 217	
11	1	Spanning sets	217 – 219	
	1	Linear independence	221 – 222	
	1	Linear independence of functions	227 – 228	

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12	1	Basis and dimension	231 – 233	
	1	Coordinates relative to a basis	233 – 237	
	1	Some fundamental theorems	237 – 242	
13	1	Row Space and column space	246 – 250	
	1	Nullspace	250 – 256	
	1	Rank and Nullity	259 – 263	
14	1	Eigenvalues	338 – 340	
	1	Eigenvectors	340 – 341	
	1	Eigenspaces	341 – 344	
15	1	General linear transformations	173 – 185	
	1	Properties of linear transformations	189 – 194	
	1	Review		
16	1	Final Exam 50%		
	1			
	1			

Theoretical course evaluation methods and weight	Participation = 10% First exam 20% Second exam 20% Final exam 50%	Practical (clinical) course evaluation methods	Semester students' work = 50% (Reports, research, quizzes, etc.) Final exam = 50%
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Approved by head of department		Date of approval	
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Extra information (to be updated every semester by corresponding faculty member)

Name of teacher	Waseem Al-Masha'leh	Office Number	126
Phone number (extension)	368	Email	w.almasha'leh@zuj.edu.jo
Office hours			