

School of Engineering and Natural Sciences / Industrial Engineering (English)

2022 - 2023 Academic Year

LINEAR ALGEBRA

Syllabus

Course Description					
Name	Code	Semester	T+A Hour	Credit	ECTS
LINEAR ALGEBRA	IND2119550	Fall Semester	3+0	3	6
Prerequisites Courses	MATEMATİK I				
Recommended Elective Courses					
Language of Instruction	English				
Course Level	First Cycle (Bachelor's Degree)				
Course Type	Required				
Course Coordinator	Assist.Prof. Cihan Bilge KAYASANDIK				
Name of Lecturer(s)	Assist.Prof. Cihan Bilge KAYASANDIK				
Assistant(s)					
Aim	1. To provide the methods of solution of systems of linear equations and the applications of matrix and determinant.2. To introduce the basic concepts of vector space, basis, dimension, linear dependency required to understand, construct, solve and interpret data spaces.3. To give an ability to apply knowledge of mathematics on engineering problems				
Course Content	This course contains; Matrices and Systems of Linear Algebraic Equations: Definitions, Notation, Matrix Algebra and Terminology and Notation for Systems of Linear Equations,Elementary Row Operations and Row-Echelon Matrices and Solving Systems of Linear Algebraic Equations,Gaussian Elimination and The Inverse of a Square Matrix,Determinants, Gauss-Jordan and Adjoint Method,Cramer Rule, Elementary Matrices and LU factorization ,Vector Spaces: Definition of a Vector Space, Subspaces and Spanning Sets,Linear Dependency and Independency, Bases and Dimension,Row and Column Spaces and The Rank-Nullity Theorem,Inner Product Spaces and Orthogonality,Linear Transformations and Eigenvalue/Eigenvector Problem: Eigenvalues and Eigenvectors and Eigenspaces,Application of Eigenvalues and Eigenvectors factorization,Diagonalization and Singular Value Decomposition, pseudo-inverse calculation,The Kernel and Range of a Linear Transformation and Further Properties of Linear Transformations .				
Course Learning Outcomes		Teaching Methods	Assessment Methods		
1. Provide arithmetic operations with matrices, elementary row operations on matrices, rank of a matrix and solve the systems of linear equations. Learn Gaussian Elimination method.		1, 14, 15	A, C		
2. Compute the inverse of matrix, determine the value of determinant of a matrix. Learn Gauss-Jordan method and Adjoint Method.		1, 14, 15	A, C		
3. Use Cramer rule to solve the systems of linear equations. Learn elementary matrices and LU factorization.		1, 14, 15	A, C		
4. Learn the importance of the concepts of a vector space such as subspace, spanning set, linear dependency and independency, basis and dimension, row and column spaces, the Rank-Nullity theorem. Understand inner product spaces and orthogonality.		1, 14, 15	A, C		
5. Evaluate the eigenvalues and the corresponding eigenvectors and eigenspaces of the matrix. Learn diagonalization and singular value decomposition. Provide application on engineering.		1, 14, 15	A, C		
Teaching Methods	1: Lecture, 14: Self-Study, 15: Problem solving				
Assessment Methods	A: Written Exam, C: Homework				
Lecture Schedule					
Sequence	Topics	Preliminary Preparation			
1	Matrices and Systems of Linear Algebraic Equations: Definitions, Notation, Matrix Algebra and Terminology and Notation for Systems of Linear Equations				
2	Elementary Row Operations and Row-Echelon Matrices and Solving Systems of Linear Algebraic Equations				
3	Gaussian Elimination and The Inverse of a Square Matrix				
4	Determinants, Gauss-Jordan and Adjoint Method				
5	Cramer Rule, Elementary Matrices and LU factorization				
6	Vector Spaces: Definition of a Vector Space, Subspaces and Spanning Sets				
7	Linear Dependency and Independency, Bases and Dimension				
8	Row and Column Spaces and The Rank-Nullity Theorem				
9	Inner Product Spaces and Orthogonality				
10	Linear Transformations and Eigenvalue/Eigenvector Problem: Eigenvalues and Eigenvectors and Eigenspaces				
11	Application of Eigenvalues and Eigenvectors factorization				
12	Diagonalization and Singular Value Decomposition, pseudo-inverse calculation				
13	The Kernel and Range of a Linear Transformation and Further Properties of Linear Transformations				
Evaluation Methods		Weight(%)			
Midterm Exam		30			
General Exam		70			

Resources
Differential Equations & Linear Algebra Second Edition, Stephen W. Goode. Prentice-Hall, Inc. 2000,1991.