The University of Jordan
School of Engineering
Industrial Engineering Department
2nd Semester 2024/2025

Course name:	Principles of Linear Algebra
Course code:	IE 0906305
Credits hours	3
Contact hours/room:	Sec 2: Monday, Wednesday (11:30-1:00)
Course instructor's name, E-mail, and phone:	Lina Al-Qatawneh lqatawneh@ju.edu.jo Ext: 22932
Office hours	Announced at office door
Text book:	Howard Anton and Anton Kaul, Elementary Linear Algebra, John Wiley & Sons, 12th Edition.
Other reference(s):	-
Course Description:	What linear algebra is, Systems of linear equations and matrices, elementary row operations, inverse, matrix equations, determinant, LU factorization. Vectors in Euclidean n-space (R^n), linear combination and linear independence. Vector spaces, subspaces, bases and dimensions. Linear transformation, null space and range, isomorphism, matrix representation of linear transformation, and similarity. Eigenvalues and eigenvectors, diagonalization, Markov chain. Inner product spaces. The dot product on Rn, orthogonal bases, orthogonal complements. Applications.
Providing Department:	Industrial Engineering
Prerequisite Course:	0301202 and 0907101
Course type	Mandatory

Assessment Methods:

Method	Weight %	Date
Midterm Exam	30	TBDL
Short Exam and quizzes	20	TBDL
Final Exam	50	TBDL

Course Learning Outcomes:

#	After successful completion of this course, the student will be able to	SO
CLO1	Design and understand systems of linear equations. Represent these systems in a matrix form (Ax=b) and determine when the system has no solution, one solution or infinite number of solutions.	**1**
CLO2	Perform the basic calculations on the matrices and vectors, and determine the inverse of a matrix using different methods such as the Gauss-Jordan elimination method.	**1**
CLO3	Solve system of linear equations using Gauss-Jordan elimination method, elementary row operations, Cramer's rule.	**1**
CLO4	Understand the theoretical workings of the cofactor expansion method and use it to determine the determinant and the inverse of a matrix.	**1**
CLO5	Understand the theoretical workings of linear transformations.	**1**
CLO6	Utilize the Matlab software to apply the various methods that are used to solve large-scale systems of linear equations.	**1**

Brief list of topics

Credit hours	Reading materials	Topics
14	Ch. 1	Systems of Linear Equations 1. Introduction to System of Linear Equations 2. Gaussian Elimination 3. Matrices and Matrix Operations 4. Inverses; Rules of Matrix Arithmetic 5. Elementary Matrices and a Method for Finding A^{-1} 6. Further Results on Systems of Equations and Invertibility 7. Diagonal, Triangular, and Symmetric Matrices
5	Ch. 2	Determinants

			1. Determinants by Cofactor Expansion 2. Evaluating Determinants by Row Reduction 3. Properties of the Determinant Function 4. A Combinatorial Approach to Determinants
	5	Ch. 3	Vector Spaces 1. Vectors in 2-Space, 3-Space and n-Space 2. Norm, Dot Product, and Distance in Rn 3. Orthogonality 4. The Geometry of Linear Systems 5. Cross Product
	20	Ch. 4, 6, 8	Linear Transformations 1. General Linear Transformations 2. Isomorphism 3. Compositions and Inverse Transformations 4. Matrices for General Linear Transformations 5. Similarity 6. Fourier Series 7. Laplace

Important Notes:	• Do not hesitate to ask questions • You are required to bring a notebook and take notes in classes. • Students are expected to attend every class session and they are responsible for all material, announcements, schedule changes, etc., discussed in class. • Discuss the assignments among yourselves • Don't Cheat; direct copying of others work will NOT be allowed or tolerated and will result in a reduction of grade. If you are found to be cheating in any way, on an exam or assignment, even signing the roll sheet for another student, you will be given an "F" for the course. There will be no exceptions. • All cases of academic dishonesty will be handled in accordance with university policies and regulations. JU policy requires the faculty member to assign ZERO grade (F) if a student misses 15% of the classes that are not excused, and 20% of the classes that are excused • Students are expected to be ready to take a quiz any time they have a class. There will be no make-up quizzes or home works. • Any students with disabilities who need accommodations in this course are encouraged to speak with the instructor as soon as possible to make appropriate arrangements for these accommodations.

The B.Sc. in industrial Engineering program enables students to achieve, by the time of graduation the following program learning outcome (SOs)			
1	*An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.*	**5**	*An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.*
2	*An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.*	**6**	*An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.*
3	*An ability to communicate effectively with a range of audiences.*	**7**	*An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.*
4	*An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.*		