Course Syllabus
According to JORDAN National Qualification Framework (JNQF)

Course Name: Linear Algebra (1)

Course Number: 0101221

General Course Information:

Course Title	Linear Algebra (1)
Course Number	0101221
Credit Hours	3 credit hours
Education Type	Traditional learning
Prerequisites/Co-requisites	…………………………
Academic Program	Bachelor Program
Program Code	101
Faculty	Faculty of Science and IT
Department	Mathematics
Level of Course	2
Academic Year /Semester	2023/2024 1st Semester
Awarded Qualification	Bachelor
Other Department(s) Involved in Teaching the Course	-
Language of Instruction	English
Date of Production	2021-2022
Date of Revision	16-10-2023

Course Coordinator:

Coordinator's Name	Waseem Almashaleh
Office No.	9121
Office Phone Extension Number	444
Office Hours	08:00-11:00 Monday-Wednesday /08:00-9:30 Sunday-Tuesday
E-mail	w.almashaleh@zuj.edu.jo

Other Instructors:

Instructor Name	Dr. Ma'mon Abu Hammad
Office No.	9319
Office Phone Extension Number	
Office Hours	11-12:30 Sunday-Tuesday. 9:30-11 Monday-Wednesday
Email	m.abuhammad@zuj.edu.jo

Course Description *(English/Arabic)*:

English	This course considered from the basic concepts of mathematics and it contains Matrices and operations on matrices, Determinants, Inverse of matrix using adjoint, matrices form of linear systems and solving linear systems, Eigenvalues and eigenvectors, Characteristic polynomial, Vectors in 2-space or 3-space, Dot product, Cross product, Vector space, Subspaces, Linearly independence, Basis and dimension, Linear transformations from $\Re^n$ to $\Re^m$.
Arabic	هذا المساق يعتبر من المواد الاساسية في الرياضيات وهو يتحدث عن المصفوفات والعمليات عليها، المحددات، معكوس المصفوفة بواسطة طريقة الأدجوينت، مصفوفات مرتبطة بنظام المعادلات الخطية وحلول الأنظمة الخطية، القيم والمتجهات

	الذاتية، كثير الحدود المميز ، المتجهات في الفضاء الثاني او الثالث، الضرب النقطي، الضرب التقاطعي، فضاء المتجهات، الفضاءات الجزئية، الاستقلال الخطي، القاعدة والبعد، التحويلات الخطية من $\Re^n$ الى $\Re^m$.

Textbook: *Author(s), Title, Publisher, Edition, Year, Book website.*

Elementary Linear Algebra by Howard Anton, 10th Edition. 2019 Publisher: John Wiley and Sons

References: *Author(s), Title, Publisher, Edition, Year, Book website.*

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.

Course Educational Objectives (CEOs):

CEO1	Students should develop a solid understanding of fundamental linear algebra concepts, including vectors, matrices, and vector spaces.
CEO2	Students should be able to perform basic matrix operations, such as addition, subtraction, multiplication, and finding determinants.
CEO3	Students should be able to solve systems of linear equations using methods like Gaussian elimination and matrix inverses.

Intended Learning Outcomes (ILO's):

Intended learning outcomes (ILOs)		Relationship to CEOs	Contribution to PLOs	Bloom Taxonomy Levels*	JNQF Descriptors**
k	Knowledge and Understanding				
ILO1-k	Recognize methods to solve a system of linear equations.	CEO3	PLO1-k	Understanding	K
ILO2-k	Describe the adjoint of a matrix to find its inverse.	CEO1	PLO2-k	Understanding	K
ILO3-k	Memorize the properties of determinants.	CEO2	PLO2-k	Applying	K
ILO4-k	Define the notion of vector spaces and subspaces.	CEO1	PLO1-k	Applying	K
S					
ILO5-s	Evaluate the determinant of a matrix.	CEO2	PLO5-s	Evaluating	S
ILO6-s	Use Cramer's Rule to solve a system of linear equations.	CEO3	PLO6-s	Applying	S
ILO7-s	Analyze whether a set S of vectors in a vector space V is a spanning set of V.	CEO1	PLO8-s	Analyzing	S
ILO8-s	Analyze whether a finite set of vectors in a vector space V is linearly independent.	CEO1	PLO8-s	Analyzing	S

C						
ILO9-c	Work independently to solve assignments in the course.	CEO2	PLO11-c	Applying	C
ILO10-c	Cooperate to work effectively in the group assignments.	CEO2	PLO11-c	Applying	C
D	<mark>Transferable skills:</mark>				
ILO11-d					

*Bloom Taxonomy Levels:						
Level #	1	2	3	4	5	6
Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
** Descriptor (National Qualification Framework Descriptors): K: Knowledge, S: Skill, C: Competency.						

Program Learning Outcome (PLOs):

(PLOs)	JNQF Descriptors**		
	K	**S**	**C**

1.	Knowledge of the main concepts in pure mathematics.	√		
2.	Knowledge of the main concepts in applied mathematics.	√		
3.	Explain concepts, principles and theories in the fields of probability and statistics.	√		
4.	Possession of technological culture related to the fields of mathematics and its applications.	√		
5.	Making use of mathematical logic in practical life.	√		
6.	Engaging scientific methodology as a way of thinking and as a tool in facing problems.		√	
7.	Applying mathematical software packages in problem solving.		√	
8.	Being capable of data analysis.		√	
9.	Capability of teaching according to modern educational techniques.		√	
10.	Develop creative and innovative methods of teaching mathematics.			√
11.	Showing the ability to work under ethical and professional standards within teams.			√
12.	Gaining critical thinking and scientific research skills.			√

** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)

Weekly Schedule *(please choose the type of teaching)*
- ✓ **Face to Face (F2F)**
- ☐ **Hybrid** *(One – To - One)*
- ☐ **Online**

Schedule of Simultaneous and their Topics:

Week	First Lecture (F2F)	Second Lecture (F2F)	ILOs	PLOs	JNQF Descriptors*
1	Introduction to systems of linear equations Gaussian elimination Homogeneous systems	Introduction to systems of linear equations Gaussian elimination Homogeneous systems	1	1	K
2	Matrices Matrix operations Rules of matrix arithmetic	Matrices, Matrix operations, Rules of matrix arithmetic	2	5	K
3	Inverses Elementary matrices Method for finding A^{-1}	Inverses Elementary matrices Method for finding A^{-1}	2	4	K
4	Further results on systems of equations and invertibility Diagonal and triangular matrices Symmetric matrices	Further results on systems of equations and invertibility Diagonal and triangular matrices Symmetric matrices	6	7	S
5	The determinant function	The determinant function, Evaluating	5	7	S

	Evaluating determinants by row reduction Evaluating determinants by column reduction	determinants by row reduction Evaluating determinants by column reduction			
6	Properties of the determinant function Determinant of a matrix product Determinant test for invertibility	Properties of the determinant function Determinant of a matrix product Determinant test for invertibility	5	8	S
7	Minors and cofactors **Cofactor Expansion** Adjoint of a matrix	Minors and cofactors **Cofactor Expansion** Adjoint of a matrix	4	1	K
	Midterm Exam (30%)				
9	Inverse of a matrix using its adjoint Cramer's rule Applications of determinants	Inverse of a matrix using its adjoint Cramer's rule Applications of determinants	2	5	K
10	Vectors in 2-Space, 3-Space, and n-Space Norm, Dot Product, and Distance in R^n Cross Product	Vectors in 2-Space, 3-Space, and n-Space Norm, Dot Product, and Distance in R^n Cross Product	7	8	S
11	Real Vector Spaces Euclidean n-space Some properties of vectors. Subspaces Solution spaces of homogeneous systems	Real Vector Spaces Euclidean n-space Some properties of vectors. Subspaces Solution spaces of homogeneous systems	7	8	S
12	Linear combination Spanning sets. Linear independence Linear independence of functions	Linear combination Spanning sets. Linear independence Linear independence of functions	8	7	S
13	Basis and dimension Coordinates relative to a basis Some fundamental theorems	Eigenvalues Eigenvectors	9	11	C
14	General linear transformations	Properties of linear transformations. Review	10	11	C
15	Projects Discussion				
16	Final Exam				

* **K: Knowledge, S: Skills, C: Competency**

Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:
- Lecture.
- learning through projects.
- learning through problem solving.

Course Policies:

A- Attendance policies:
    The maximum allowed absences is 15% of the lectures.

B- Absences from exams and handing in assignments on time:
    Midterm exam can be retaken based on approval of excuse by the instructor's discretion.
    Not handing assignment on time will incur penalties.

C- Academic Health and safety procedures

D- Honesty policy regarding cheating, plagiarism, and misbehaviour:
    Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.

E- Grading policy:
- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Discussion Forums, Quizzes) **20%**
- Midterm 30**%**
- Final Exam 50**%**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

Required Equipment:

- PC / Laptop with webcam and mic
- Internet Connection
- Access to the ZUJ E-Learning Platform at https://exams.zuj.edu.jo/
- E-learning plan

Assessment Tools Implemented in the Course:

- Final Exam
- Midterm Exam
- Quizzes
- Homework
- Periodic reports for learning assessment

Responsible Persons and their Signatures:

Course Coordinator	Waseem Almashaleh	Completed Date	Oct / 2023
		Signature	

Received by (Department Head)		Received Date	/ /
		Signature	