



## Course Specifications

<b>Course Title:</b>	Linear Algebra	
<b>Course Code:</b>	MATH 222	
<b>Program:</b>	Computer Science	
<b>Department:</b>	Basic Sciences and Humanities	
<b>College:</b>	College of Computer and Information Sciences	
<b>Institution:</b>	Majmaah University	



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## A. Course Identification

<b>1. Credit hours:</b>
<b>2. Course type</b>
a. University <input type="checkbox"/> College <input checked="" type="checkbox"/> Department <input type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
<b>3. Level/year at which this course is offered: Level 5</b>
<b>4. Pre-requisites for this course (if any): N/A</b>
<b>5. Co-requisites for this course (if any): N/A</b>

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	44	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

### 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	33
2	Laboratory/Studio	
3	Tutorial	11
4	Others (specify)	
	<b>Total</b>	44



## B. Course Objectives and Learning Outcomes

### 1. Course Description

*Catalog Description:* This course includes the following topics:

- 1) Matrices and Gauss Elimination: Elementary row operations, Transpose of a matrix, Inverse of a square matrix, Linear equation systems and Gauss eliminations.
- 2) Determinants: Determinants and their properties, classical adjoint matrix; Cramer's rule.
- 3) Vector spaces: Basic definitions, subspaces, linear dependence and independence, bases and dimensions, Rank of a Matrix.
- 4) Linear transformations: Basic definitions, the matrix of a transform, Kernel and Range of a linear transformation, Matrices of linear transformations, Coordinates and change of basis.
- 5) Eigenvalues and Eigenvectors: Characteristic polynomial, diagonalization of matrices, Applications involving Powers of matrices.

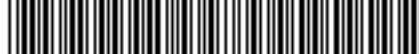
### 2. Course Main Objective

This course aims at giving student knowledge in fields:

- 1) Introduce students to the subject of linear algebra which is essential for subsequent courses in mathematics and computer science.
- 2) Let students be familiar with basics of matrices and determinants and their applications to solve systems of linear equations.
- 3) Let students be familiar with basics of vector spaces and linear transformations.
- 4) Let students be familiar with the notions of eigenvalues and eigenvectors with some of their applications.

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge and Understanding</b>	
1.1		
1.2		
1.3		
1...		
2	<b>Skills :</b>	
2.1	CLO1: Solve systems of linear equations using Gauss Elimination, Cramer's rule, and inverse matrix method.	S5
2.2	CLO2- Understand the general concepts of vector spaces, subspaces, linear dependence and independence, bases, and linear transformations.	S5
2.3	CLO3- Calculate the eigenvalues and eigenvectors of squared matrices.	S5
2.4	CLO4- Solve important problems applying methods of linear algebra.	S5
3	<b>Values:</b>	
3.1		
3.2		
3.3		
3...		



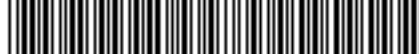
## C. Course Content

No	List of Topics	Contact Hours
1	Introduction to matrices, Elementary row operations	3
2	Inverse of a square matrix, Transpose of a matrix.	2
3	Linear equation systems and Gauss eliminations	4
4	Determinants and their properties, Determinants	4
5	classical adjoint matrix	2
6	Cramer's rule.	3
7	Vector spaces: Basic definitions, subspaces	3
8	Linear dependence and independence	3
9	Basis and dimensions, Rank of a Matrix	3
10	Linear transformations: Basic definitions, The matrix of a transform	3
11	Kernel and Range of a linear transformation	2
12	Matrices of linear transformations, Coordinates and change of basis	4
13	Characteristic polynomial, Eigenvalues and Eigenvectors	3
14	Diagonalization of matrices, Applications involving Powers of matrices	2
15	Revision	3
<b>Total</b>		<b>44</b>

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and Understanding</b>		
1.1			
1.2			
...			
<b>2.0</b>	<b>Skills</b>		
2.1	CLO-1 Solve systems of linear equations using Gauss Elimination, Cramer's rule, and inverse matrix method	Classroom Teaching	Quizzes Mid Exam Assignments Class Test Final Exam
2.2	CLO-2 Solve first-order differential equations Understand the general concepts of vector spaces, subspaces, linear dependence and independence, bases, and linear transformations	Classroom Teaching	Quizzes Mid Exam Assignments Class Test Final Exam
2.3	CLO-3 Calculate the eigenvalues and eigenvectors of squared matrices	Classroom Teaching	Quizzes Mid Exam Assignments Class Test Final Exam
2.4	CLO-4 Solve important problems applying methods of linear algebra..	Classroom Teaching	Quizzes Mid Exam Assignments Class Test



Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
			Final Exam
<b>3.0</b>	<b>Values</b>		
3.1			
3.2			
...			

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes	3,7,11	20%
2	Assignments	3,6,9,11	15%
3	Mid Term Exam	8	20%
4	Class Participation	All weeks	5%
5	Final Exam	12	40%
6			
7			
8			

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

**Arrangements for the availability of faculty and teaching staff for individual student consultations and academic advice :**

- Each student is allotted to an academic advisor for guidance and counseling.
- Available for a minimum of 2 hours per week/course, as communicated to the students.
- Student also contacts through social networking websites / Blackboard/ Email for advice and consultations

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	Gareth Williams “Linear Algebra With Applications” Jones and Bartlett, 8th Edition, (2014). <b>ISBN-13:</b> 978-1284120097  David C. Lay “Linear Algebra, and Its Applications”, Pearson, 5 <sup>th</sup> Edition (2016)  D. Poole, “Linear Algebra: A Modern Introduction”, Brooks Cole; 3 <sup>rd</sup> ed. (2011).
<b>Essential References Materials</b>	
<b>Electronic Materials</b>	



<b>Other Learning Materials</b>	
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## 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Smart Board, Projector
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Internet Connection

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Final Exam Answer Scripts Verification	Peer faculty members	Review
Course Feedback	Students	Survey

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

<b>Council / Committee</b>	Dr. Ahmed Farghaly
<b>Reference No.</b>	
<b>Date</b>	18 September fall 2022