هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

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

Table of Contents

A. Course Identification

1. Credit hours:
2. Course type **a.** University ☐ College ☑ Department ☐ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Level 5
4. Pre-requisites for this course (if any)**:** N/A
5. Co-requisites for this course (if any)**: N/A**

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)	
	Total	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	**Knowledge and Understanding**	
1.1		
1.2		
1.3		
1...		
2	**Skills :**	
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	**Values:**	
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
Total		44

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1			
1.2			
…			
2.0	**Skills**		
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
3.0	**Values**		
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

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

Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom
Technology Resources (AV, data show, Smart Board, software, etc.)	Smart Board, Projector
Other Resources (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

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