Course Specifications

Course Title:	**Linear Algebra**
Course Code:	**MATH 210**
Program:	**Information and Computer Science**
Department:	**Computer Science and Information**
College:	**Science at Az Zulfi**
Institution:	**Al- 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: 2
4. Pre-requisites for this course (if any)**:** MTH 231
5. Co-requisites for this course (if any)**:** Nil

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	*	%80
2	**Blended**	*	%10
3	**E-learning**	*	--
4	**Correspondence**	*	--
5	**Other**	*	%10

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	--
3	**Tutorial**	30
4	**Others** (specify)	--
	Total	60
Other Learning Hours*		
1	**Study**	45
2	**Assignments**	15
3	**Library**	05
4	**Projects/Research Essays/Theses**	10
5	**Others** (specify)	00
	Total	(60+75 = 135)

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The topic contains:

Fundamentals of Vector Spaces: Vector Spaces, dot and cross product, Linear Transformations, Coordinate Systems and Dimension & Rank.

Matrix Algebra: Matrix Operations, Inverse of a Matrix, Partitioned Matrices, Matrix Factorizations and Determinants & Properties.

Systems of Linear Equations: Row Reduction and Echelon Forms, Vector Equations, Solution Sets of Linear Systems Methods for solving systems of linear equations and Applications of Linear Systems

Eigenvalues and Eigenvectors: Eigenvectors and Eigenvalues of matrix, Diagonalization and Linear Transformations.

2. Course Main Objective

1. Ability to explain, with examples, the importance of a range of mathematical concepts, including setting up real life application s in differential equations.
2. Ability to demonstrate basic knowledge and understanding of essential facts, concepts, principles, and theories relating to topics covered.
3. Problem solving abilities, including ability to apply mathematical principles in setting up and solving problems.
4. Evaluation of homework assignments, including Linear Algebra Toolkit, Matlab, Maple, and/or Mathematica problem solutions.
5. Evaluation of writing assignments for quality of concepts, issues, and analytical skills.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge:**	
1.1	• identify a linear system of equations;	ICS-a2
1.2	• understand the geometry of two- and three-dimensional linear systems;	ICS-a2
1.3	• find the solution set of a system of linear equations;	ICS-a2
1.4	• understand the basic matrix operations and their properties;	ICS-a2
1.5	• understand and prove properties of the inverse of a matrix;	ICS-a2
1.6	• calculate a determinant by expansion of cofactors;	ICS-a2
1.7	• work with vectors and understand their basic operations;	ICS-a2
1.8	• define a vector space and determine whether a given set is a vector space;	ICS-a2
2	**Skills :**	
2.1	find the row and column space, the rank, the null space, and the nullity of a matrix;	b1
2.2	• understand and prove properties of linear transformations;	b1
2.3	• represent some linear transformations using matrices;	b1
2.4	• find the characteristic polynomial of a square matrix;	b1
2.5	• compute the eigenvalues and eigenvectors of a square matrix;	b1
2.6	• compute an orthogonal basis using the Gram-Schmidt process;	b1
2.7	• compute the orthogonal diagonalization of a real symmetric matrix;	b1
3	**Competence:**	

C. Course Content

No	List of Topics	Contact Hours
1	Linear Equations in Linear Algebra:	4

	Systems of Linear Equations , Row Reduction and Echelon Forms, Vector Equations , The Matrix Equation Ax = b , Solution Sets of Linear Systems , Applications of Linear Systems , Linear Independence and Matrix of a Linear Transformation	
2	Matrix Algebra: Matrix Operations, The Inverse of a Matrix , Characterizations of Invertible Matrices , Partitioned Matrices , Matrix Factorizations and Applications to Computer Graphics	4
3	Determinants: Determinants & Properties	2
4	Vector Spaces: Vector Spaces and Subspaces , Null Spaces, Column Spaces, and Linear Transformations , Coordinate Systems , Dimension & Rank and Change of Basis	6
5	Eigenvalues and Eigenvectors: Eigenvectors and Eigenvalues , The Characteristic Equation , Diagonalization , Eigenvectors and Linear Transformations and Complex Eigenvalues	4
6	Orthogonality and Least Squares: Inner Product, Length, and Orthogonality , Orthogonal Sets , Orthogonal Projections , The Gram—Schmidt Process and Least-Squares Problems	6
7	Symmetric Matrices and Quadratic Forms: Diagonalization of Symmetric Matrices and Quadratic Forms	4
Total		

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**		
1.1		Developing basic communicative ability through: - Lecturing, - Team work, - Oral Discus	-Quizzes, -Web search, -Graded homework, -Class Participation, -Midterms and Final Exams,
1.2			
…			
2.0	**Skills**		
2.1		□ Lectures □ Exercises demonstrations □ Case studies □ Individual □ Presentations □ Brainstorming	□ Class Participation □ Essay Question □ Presentation □ Research
2.2			
…			
3.0	**Competence**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework assignments, Oral discussions	Weekly	30%

#	Assessment task*	Week Due	Percentage of Total Assessment Score
2	Written summary reports through web search	3, 7, 9, 13	
3	Class participation in solving problems	Weekly	
4	Take-home-exams	5, 11	
5	Project groups	5, 10	
6	Quizzes	2, 4, 8, 14	
7	First Exam	6	15 %
8	Second Exam	12	15 %
9	Final Exam	16	40 %

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

E. Student Academic Counseling and Support

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

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

Office hours: Mon: 10-12, Wed: 8-10

Email: m.jemmali@mu.edu.sa

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Linear Algebra and Its Applications 4th Edition) Kenneth M Hoffman, Ray Kunze Pearson December, 2018 978-0321836144 Schaum's Outline of Linear Algebra , 5th Edition by Seymour Lipschutz (Author), Marc Lipson (Author) McGraw-Hill Education December, 2017 978-0071794565
Essential References Materials	Linear Algebra and Its Applications 4th Edition) Kenneth M Hoffman, Ray Kunze Pearson December, 2018 978-0321836144
Electronic Materials	https://www.khanacademy.org/math/linear-algebra https://ocw.mit.edu/courses/mathematics/18-06sc-linear-algebra-fall-2011/
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classrooms with required digital aids and to support traditional method of teaching using blackboard. • Classrooms with proper lighting and air conditioning system integrated with the sound System /audio system. • Classroom with smart board interface, display screen and a computer to aid the sessions
Technology Resources (AV, data show, Smart Board, software, etc.)	Smart Board with supporting software / computers with updated versions of software as required to understand the subject concepts.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student-faculty management meetings.	Program Leaders	Direct
Discussion within the staff members teaching the course	Peer Reviewer	Direct
Departmental internal review of the course.	Peer Reviewer	Direct
Reviewing the final exam questions and a sample of the answers of the students by others.	Peer Reviewer	Direct
Visiting the other institutions that introduce the same course one time per semester.	Faculty	Indirect
Student-faculty management meetings.	Program Leaders	Direct
Discussion within the staff members teaching the course	Peer Reviewer	Direct

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	Program plan committee
Reference No.	
Date	08/09/2019