Course Specification
(Bachelor)

Course Title:	Linear Algebra
Course Code:	284Math-3
Program:	B.Sc. of Computer Science + Information Systems
Department:	Computer Science and Information Systems
College:	Computer Science and Information Systems
Institution:	Najran University
Version:	2
Last Revision Date:	17-05-2025

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐University	☒ College	☐Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (5/3)					
4. Course General Description:					
This course introduces types of matrices, properties of matrices and algebraic of matrices. Also, it introduces solving of linear systems, computing determinants of matrices, vectors (in the plane and space), linear combination of vectors, spans and linearly dependent and linearly independent of vectors. Finally, it covers linear transformations, similarity and orthogonal, eigenvalues and eigenvectors of matrix.					
5. Pre-requirements for this course (if any):					
none					
6. Co-requisites for this course (if any):					
none					
7. Course Main Objective(s):					
The main objective of this course is providing students the scientific facts and concepts about the matrix, its properties and operations. Besides that, solving linear system of equations using several methods. In addition, demonstrating the concepts the vectors in multidimensional is offering with their algebraic operations of them.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Define key concepts in linear systems, matrices, determinants, and vector spaces.		Lecture Cooperative learning Problem solving Brainstorming	Assignments Quiz Midterm Exam Final Exam
1.2	Describe properties of matrices, matrix transformations, and special types of matrices.			
1.3	Explain the significance of eigenvalues and eigenvectors in mathematical and applied contexts.			
2.0	**Skills**			
2.1	Solve systems of linear equations using Gaussian elimination and matrix methods.		Lecture Cooperative learning Problem solving Brainstorming	Assignments Quiz Midterm Exam Final Exam
2.2	Compute determinants and apply Cramer's Rule to solve linear systems.			
2.3	Perform operations with vectors and matrices in Euclidean spaces.			
2.4	Determine eigenvalues and eigenvectors and use them for diagonalization and solving differential equations.			

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.5	Apply linear algebra methods to real-world problems such as traffic flow, circuits, and Markov chains.			
3.0	**Values, autonomy, and responsibility**			
3.1	Work effectively with in groups and independently			

C. Course Content

No	List of Topics	Contact Hours
1.	Algebra of Matrices: Matrices - Matrix Addition and Scalar Multiplication - Summation Symbol - Matrix Multiplication - Transpose of a Matrix - Square Matrices - Powers of Matrices, Polynomials in Matrices - Invertible (Nonsingular) Matrices - Special Types of Square Matrices - Complex Matrices - Block Matrices	6
2.	Systems of Linear Equations and Matrices: Introduction to Systems of Linear Equations - Gaussian Elimination - Inverses; Algebraic Properties of Matrices - Elementary Matrices and a Method for Finding A^{-1} - More on Linear Systems and Invertible Matrices - Diagonal, Triangular, and Symmetric Matrices .	12
3.	Determinants: Determinants by Cofactor Expansion - Evaluating Determinants by Row Reduction - Properties of Determinants – Solving linear systems by Cramer's Rule .	9
4.	Vectors in $\mathbb{R}^n$ and $\mathbb{C}^n$, and Spatial Vectors: Vectors in $\mathbb{R}^n$- Vector Addition and Scalar Multiplication - Dot (Inner) Product - Located Vectors, Hyperplanes, Lines, Curves in $\mathbb{R}^n$ - Vectors in $\mathbb{R}^3$ (Spatial Vectors), ijk Notation – Complex Numbers - Vectors in $\mathbb{C}^n$	9
5	Eigenvalues and Eigenvectors: Eigenvalues and Eigenvectors, Diagonalization, Complex Vector Spaces, Dynamical Systems and Markov Chains.	9
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm Exams	6-8	20

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
		11-13	20
2.	Assignments & Quizzes	During classes	10
3.	Final Exam	16-18	50
4.	Final Exam	16-18	50

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	- Anton, Howard, Elementary linear algebra : applications version / Howard Anton, Chris Rorres. -- 11th edition, 2014.
Supportive References	- Elementary Linear algebra (7th Edition) By: Howard Anton John Wiley & sons(1994) - Hawkins, T., Lebesgues Theory of Integration, University of Wisconsin press, Madison, 1970.
Electronic Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom with 30 seats.
Technology equipment (projector, smart board, software)	- Blackboard Platform - Mathematica Program Projector
Other equipment (depending on the nature of the specialty)	**N/A**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Student Questionnaire (Indirect)
Effectiveness of Students assessment	Peer Reviewer	Rubrics (Indirect)
Quality of learning resources		

Assessment Areas/Issues	Assessor	Assessment Methods
The extent to which CLOs have been achieved	Faculty	Direct
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	