National University of Engineering (UNI)
School of Computer Science
Syllabus 2026-I

1. COURSE

MA101FCCS. Linear Algebra (Mandatory)

2. GENERAL INFORMATION

2.1 Course	:	MA101FCCS. Linear Algebra
2.2 Semester	:	1^{st} Semester
2.3 Credits	:	4
2.4 Horas	:	3 HT; 2 HP;
2.5 Duration of the period	:	16 weeks
2.6 Type of course	:	Mandatory
2.7 Learning modality	:	Face to face
2.8 Prerrequisites	:	None

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

Linear algebra is fundamental to computer science, providing essential tools for algorithm analysis, computer graphics, machine learning, and many other areas. This course provides a solid foundation in the concepts and techniques of linear algebra, with a focus on its application in computing.

5. GOALS

- Understand the fundamental concepts of linear algebra, including vector spaces, matrices, linear transformations, and systems of linear equations.
- Apply linear algebra techniques to solve problems in various computational contexts.
- Develop abstract reasoning and logical thinking skills to address mathematical problems.

6. COMPETENCES

1) Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions. (Assessment)

AG-C07) Computing Knowledge: Applies appropriate knowledge of mathematics, science, and computing. (Assessment)

6) Apply computer science theory and software development fundamentals to produce computing-based solutions. (Usage)

AG-C08) Problem Analysis: Identifies, formulates, and analyzes complex computing problems. (Usage)

AG-C11) Tool Usage: Applies modern computing tools in problem-solving. (Familiarity)

7. TOPICS

Unit 1: Vector Spaces (8 hours)	
Competences Expected: 1,6,AG-C07,AG-C08	
Topics	**Learning Outcomes**
• Definition of vector space and subspace. • Linear combinations, linear independence, and bases. • Dimension and rank.	• Define and give examples of vector spaces and subspaces. [Familiarizarse (*Familiarity*)] • Determine the linear independence of a set of vectors. [Usar (*Usage*)] • Calculate bases and the dimension of a vector space. [Evaluar (*Assessment*)]
Readings : [Str16], [LLM16]	

Unit 2: Matrices and Systems of Linear Equations (8 hours)	
Competences Expected: 1,6,AG-C07	
Topics	**Learning Outcomes**
• Matrix operations. • Gaussian elimination and reduced row echelon form. • Solving systems of linear equations. • Inverse matrices and determinants.	• Perform matrix operations. [Familiarizarse (*Familiarity*)] • Solve systems of linear equations using Gaussian elimination. [Usar (*Usage*)] • Calculate the inverse of a matrix and its determinant. [Evaluar (*Assessment*)]
Readings : [Str16], [LLM16]	

Unit 3: Linear Transformations (8 hours)	
Competences Expected: 1,6,AG-C07	
Topics	**Learning Outcomes**
• Definition and examples of linear transformations. • Kernel and image of a linear transformation. • Transformation matrices.	• Define and give examples of linear transformations. [Familiarizarse (*Familiarity*)] • Calculate the kernel and image of a linear transformation. [Usar (*Usage*)] • Represent linear transformations using matrices. [Evaluar (*Assessment*)]
Readings : [Str16], [LLM16]	

Unit 4: Eigenvalues and Eigenvectors (8 hours)	
Competences Expected: 1,6,AG-C07	
Topics	**Learning Outcomes**
• Definition and calculation of eigenvalues and eigenvectors. • Diagonalization of matrices. • Applications of eigenvalues and eigenvectors.	• Define and calculate eigenvalues and eigenvectors. [Familiarizarse (*Familiarity*)] • Diagonalize matrices. [Usar (*Usage*)] • Apply eigenvalues and eigenvectors to solve problems. [Evaluar (*Assessment*)]
Readings : [Str16], [LLM16]	

Unit 5: Orthogonality and Least Squares (8 hours)	
Competences Expected: 1,6,AG-C07	
Topics	**Learning Outcomes**
• Inner product and orthogonality. • Orthogonal projections. • Least squares method.	• Define and calculate inner product and orthogonality. [Familiarizarse (*Familiarity*)] • Calculate orthogonal projections. [Usar (*Usage*)] • Apply the least squares method. [Evaluar (*Assessment*)]
Readings : [Str16], [LLM16]	

Unit 6: Applications in Computing (8 hours)	
Competences Expected: 1,6,AG-C07	
Topics	**Learning Outcomes**
• Applications in computer graphics. • Applications in machine learning. • Applications in algorithm analysis.	• Describe applications of linear algebra in computer graphics. [Familiarizarse (*Familiarity*)] • Explain how linear algebra is used in machine learning. [Usar (*Usage*)] • Analyze the complexity of algorithms using linear algebra concepts. [Evaluar (*Assessment*)]
Readings : [Str16], [LLM16]	

8. WORKPLAN

8.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

********* EVALUATION MISSING ********

10. BASIC BIBLIOGRAPHY

[LLM16] David C Lay, Steven R Lay, and Judi J McDonald. *Linear Algebra and Its Applications*. Pearson, 2016.

[Str16] Gilbert Strang. *Introduction to Linear Algebra*. Wellesley-Cambridge Press, 2016.