REPUBLIKA E SHQIPËRISË

"ISMAIL QEMALI" UNIVERSITY
FACULTY OF TECHNICAL AND NATURAL SCIENCES
COMPUTER SCIENCE DEPARTMENT

SYLLABUS
LINEAR ALGEBRA

Curriculum Developer	**Assoc. Prof. Miftar Ramosacaj** *Ph.D. in Mathematics*

Credits and hours	Credits	Hour in the classroom						Individual study	Total
		Lectures	Seminars	Labs	Practice	Course project	Total		
	6 ECTS	45	30	0	0	0	75	75	150

Course Typology	A – Disciplines of general education (basic)
Academic year /semester	2025-2026/ First year, first semester
Nature and requirement of the course	Mandatory course
Study program	Bachelor in Computer Engineering
Course Code	MAT 175E
Email of curriculum developer / lecturer	miftar.ramosacaj@univlora.edu.al

SUMMARY AND LEARNING OUTCOMES

Course Description	This course concisely introduces linear algebra, covering systems of linear equations, matrices, vector spaces, linear transformations, and eigenvalues/eigenvectors. Emphasis is placed on fundamental principles and their applications in computer engineering.
Course Objectives	▪ Present essential theoretical foundations of linear algebra. ▪ Develop problem-solving skills through analytical and computational approaches. ▪ Demonstrate practical applications in fields related to computer engineering. ▪ Foster critical thinking on how linear algebra structures underlie advanced technological solutions.
Expected Outcomes	Upon completion, students will be able to: □ Solve and interpret linear systems and matrix operations. □ Understand and apply concepts of vector spaces and linear transformations. □ Employ eigenvalues and eigenvectors in analyzing systems and data. □ Utilize orthogonality and factorization methods in computational tasks. □ Relate fundamental linear algebra concepts to real-world engineering challenges.

REPUBLIKA E SHQIPËRISË

"ISMAIL QEMALI" UNIVERSITY

FACULTY OF TECHNICAL AND NATURAL SCIENCES

COMPUTER SCIENCE DEPARTMENT

FUNDAMENTAL CONCEPTS

- Vector Spaces: Definitions, subspaces, basis, dimension.
- Matrices: Representation, operations, inverses, and LU factorization.
- Linear Transformations: Properties, matrix representation, and isomorphisms.
- Eigenvalues and Eigenvectors: Diagonalization, spectral analysis, and applications.
- Orthogonality: Dot products, projections, orthonormal sets, and factorization methods.

Week	COURSE TOPICS	Reference Literature	Teaching Methodology
I.	***Topic 1 – 3:*** *Presentation of Syllabus MAT 175E. Systems of linear equations.* ***Seminar –*** *Exercises on "Systems of linear equations".*	*Syllabus MAT 175E* *[1] page. 1-46*	Lecture 3 hours *Seminars 2 hours*
II.	***Topic 4 – 6****: Euclidean space.* ***Seminar*** *- Exercises on "Euclidean space.".*	*[1] page. 47-80*	Lecture 3 hours *Seminars 2 hours*
III.	***Topic 7 – 9****: Matrices.* ***Seminar*** *- Exercises on "Matrices."*	*[1] page. 81-126*	Lecture 3 hours *Seminars 2 hours*
IV.	***Topic 10 – 12****: Matrices (cont.)* ***Seminar*** *- Exercises on "Matrices (cont.)."*	*[1] page. 127-150*	Lecture 3 hours *Seminars 2 hours*
V.	***Topic 13 – 15****: Subspaces* ***Seminar*** *- Exercises on "Subspaces."*	*[1] page. 151-180*	Lecture 3 hours *Seminars 2 hours*
VI.	***Topic 16 –18****: Determinants* ***Seminar*** *- Exercises on "Determinants."*	*[1] page. 181-216*	Lecture 3 hours *Seminars 2 hours*

Week	COURSE TOPICS	Reference Literature	Teaching Methodology
VII.	***Topic 19 – 21**: Eigenvalues and eigenvectors* ***Seminar** - Exercises on "Eigenvalues and eigenvectors".*	*[1] page. 217-248*	Lecture 3 hours *Seminars 2 hours*
VIII.	***Topic 22 – 24**:Eigenvalues and eigenvectors (cont.)* ***Seminar** - Exercises on "Eigenvalues and eigenvectors (cont.)."*	*[1] page. 249-276*	Lecture 3 hours *Seminars 2 hours*
IX.	***Topic 25 – 27**: Vectors spaces* ***Seminar -** Exercises on "Vectors spaces."*	*[1] page. 277-302*	Lecture 3 hours *Seminars 2 hours*
X.	***Topic 28 – 30**: Orthogonality* ***Seminar** - Exercises on "Orthogonality."*	*[1] page. 303-323*	Lecture 3 hours *Seminars 2 hours*
XI.	***Topic 31 – 33**: Orthogonality (cont.)* ***Seminar** - Exercises on "Orthogonality (cont.)."*	*[1] page. 324-348*	Lecture 3 hours *Seminars 2 hours*
XII.	***Topic 34 – 36**: Linear transformations* ***Seminar** - Exercises on "Linear transformations."*	*[1] page. 349-363*	Lecture 3 hours *Seminars 2 hours*
XIII.	***Topic 37 – 39:** Linear transformations (cont.)* ***Seminar** - Exercises on "Linear transformations (cont.)."*	*[1] page. 364-378*	Lecture 3 hours *Seminars 2 hours*

Week	COURSE TOPICS	Reference Literature	Teaching Methodology
XIV.	***Topic 40*** *–* ***42****: Inner product spaces* ***Seminar*** *- Exercises on "Inner product spaces".*	*[1] page. 379-408*	Lecture 3 hours *Seminars 2 hours*
XV.	***Topic 43*** *–* ***45****: Additional topics and applications* ***Seminar*** *– Exercises on "Additional topics and applications".*	*[1] page 409-441*	Lecture 3 hours *Seminars 2 hours*

REPUBLIKA E SHQIPËRISË

"ISMAIL QEMALI" UNIVERSITY
FACULTY OF TECHNICAL AND NATURAL SCIENCES
COMPUTER SCIENCE DEPARTMENT

KNOWLEDGE ASSESSMENT

ATTENDANCE

Attendance for lectures and seminars is mandatory at 75%. Otherwise, the student loses the right to take the exam. Absences are the student's personal responsibility, as are any missed assignments or tests.
A student with less than 75% attendance for the period relevant to any partial exam during which they will be tested will not be allowed to take the corresponding exam and will be graded with an M (Missing). If the student has attended the course but does not show up for the next exam, they will be graded NP (Not Present).

CONTINUOUS ASSESSMENT

Assessment Method	*Assessment Time*	*Learning Topics to be Assessed*	*Maximum Points*	*Knowledge Testing Method*	*Test Content*
Partial Exam	Week 7-8	1-15	25 points	Written exam	Concepts and exercises
Final Exam	End of the semester	16-45	60 points	Written exam	Concepts and exercises
Continuous Assessment* (Course Assignment*)	During the semester	-	15 points	Oral and written presentation of knowledge in the form of submitted assignments and classroom activity	Concepts and exercises

* Continuous Assessment – *This means active participation in lectures and seminars, full assignment engagement, and submission according to deadlines. 15 points = 5 points (continuous assessment in lectures) + 10 points (continuous assessment in seminars)*

The conversion of points to the final grade is as follows:

0 - 40 points	41 - 50 points	51 - 60 points	61 - 70 points	71 - 80 points	81 - 90 points	91 - 100 points
4	5	6	7	8	9	10

LITERATURE

Primary literature

[1] Linear Algebra with Applications. Jeffrey Holt; 8 Edition. 2013. Publisher: W. H. Freeman and Company. ISBN-13: 978-0-7167-8667-2

Recommended literature

[2] Lectures on Linear Algebra and its Applications. Philip Korman; 2023. Publisher Walter de Gruyter GmbH, Berlin/Boston. ISBN 978-3-11-108540-1
[3] Linear Algebra with Applications. Steven J. Leon, Lisette G. de Pillis; 10-th edition; Publisher: Pearson. eBook ISBN 13: 978-1-292-35487-3

REPUBLIKA E SHQIPËRISË

"ISMAIL QEMALI" UNIVERSITY
FACULTY OF TECHNICAL AND NATURAL SCIENCES
COMPUTER SCIENCE DEPARTMENT

FINAL REMARKS FROM THE COURSE INSTRUCTOR	
Provisions	Students are expected to develop values and ethics that reflect their interests and behavior from a professional perspective. Students must respect individual differences, be cooperative, abide by ethical rules, respect ethnic differences, and assist individuals with disabilities with inclusive and supportive attitudes.
Delays	Delays in lectures and seminars will not be tolerated.
Academic integrity and copyright	Each test or written work must be wholly individual and original. Plagiarism (mixed combinations) or information theft through various means will not be allowed.

HEAD OF DEPARTMENT OF COMPUTER SCIENCES
Dr. Alketa HYSO