

■ CE51 - Numerical Linear Algebra

GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	CE51	SEMESTER	E
COURSE TITLE	NUMERICAL LINEAR ALGEBRA		
INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	ECTS	
Lectures	4	5	
COURSE TYPE	Scientific Field		
PREREQUISITE COURSES	Introduction to Numerical Analysis		
LANGUAGE OF TEACHING AND EXAMINATIONS	Greek/English		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	http://eclass.uowm.gr/		

LEARNING OUTCOMES

Learning Outcomes
<p>Upon successful completion of the course, the students:</p> <ul style="list-style-type: none"> • will be able to understand the basic matrix theory, • will be able to apply numerical methods for solving linear systems, • will know the basic matrix factorizations

- will be able to choose the appropriate method taking into account the stability, the convergence rate as well as the state of the system,
- will be able to apply MATLAB functions for linear algebra,
- will be able to implement the above methods with their own functions in MATLAB.

General Competencies

- Search, analysis and synthesis of data and information, using the necessary technologies.
- Making decisions.
- Promotion of free, creative and inductive thinking.

CONTENT OF THE COURSE

Vector and matrix norms. Numerical Solution of Linear Systems. Sensitivity of linear systems.
 Direct Methods: Gaussian elimination, Gauss transformations. LU factorizations, pivoting.
 Factorization of special matrices LDM, LDLT and Cholesky.
 Iterative methods: Jacobi, Gauss-Seidel, SOR.
 The linear least squares problem.
 Householder transformations, QR factorization, SVD.
 Implementation with MATLAB.

TEACHING AND LEARNING METHODS - EVALUATION

TEACHING METHOD	In the classroom.	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Software MATLAB. e-Lectures. Use of e-class.	
TEACHING ORGANIZATION	Activity	Semester Workload
	Lectures	52 hours
	Programming Tasks in MATLAB	26 hours
	Individual Study	47 hours
	Course Total (25 hours per ECTS)	125 hours

STUDENT EVALUATION	Programming Tasks in MATLAB 30%. Written final examination 70%.
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RECOMMENDED BIBLIOGRAPHY

1. G. Avdelas, Th. Simos, Numerical Linear Algebra, Tsotras pub., 2016 (Greek)
2. G.H. Golub, C.F. Van Loan, Matrix Computations, Pedio pub., 2015 (Greek translation).
3. A. Sifaleras, G. Stefanidis, Linear Algebra with MATLAB and SageMath, Tziola pub., 2021 (Geek)
4. G Papageorgiou, X. Tsitouras, Numerical Analysis with applications in MATLAB and MATHEMATICA, Tsotras pub. (Greek)
5. I. Th, Famelis, Computational Mathematics, Kritiki pub., 2021
6. N. Misyrilis, Numerical Analysis: an algothmic approach, Tsotras pub., 2022 (Greek)