

COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_IC334	SEMESTER OF STUDIES	7 th
COURSE TITLE	NUMERICAL LINEAR ALGEBRA		
INDEPENDENT TEACHING ACTIVITIES <i>if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits</i>	TEACHING HOURS PER WEEK	ECTS CREDITS	
Lectures and Tutorials	4	6	
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i>	Elective course		
PREREQUISITE COURSES:	<u>Recommended prerequisite knowledge:</u> LINEAR ALGEBRA I, INTRODUCTION TO NUMERICAL ANALYSIS		
TEACHING AND ASSESSMENT LANGUAGE:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBPAGE (URL)	https://eclass.math.upatras.gr/courses/MATHDEP186/		

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area
- Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B
- Guidelines for writing Learning Outcomes

The student will be able to use numerical methods to solve mathematical problems of linear algebra. At the end of this course the student will further develop the following skills:

- Understanding of the basic numerical methods of linear algebra.
- Ability to apply a numerical method to solve a real problem of linear algebra.
- Ability to distinguish the advantages and disadvantages of each method to choose the most appropriate for a specific problem.
- Ability to implement Matlab (/Julia) code for solving a numerical problem of linear algebra.

After successfully attending the course, the student will be able to provide approximate solutions to mathematical problems of linear algebra using an appropriate numerical method.

General Abilities

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology

Adapting to new situations

Decision-making

Working independently

Team work

Working in an international environment

Working in an interdisciplinary environment

Production of new research ideas

Project planning and management

Respect for difference and multiculturalism

Respect for the natural environment

Showing social, professional and ethical responsibility and sensitivity to gender issues

Criticism and self-criticism

Production of free, creative and inductive thinking

Others...

- Search, analyze and synthesize data and information, using the necessary technologies.
- Decision making.
- Autonomous work.
- Promote free, creative and inductive thinking.
- Working in an interdisciplinary environment.

3. COURSE CONTENT

Matrix decomposition (LU, LDLt, Choleski), Numerical Solution of Linear Systems (LU, SOR, Conjugate Gradient method). Numerical Determination of Eigenvalues and Eigenvectors: iterative methods (power method and variations), Sturm sequence, Transformation methods (Jacobi, Givens, Householder, LR, QR). Linear least squares method, Singular-value decomposition (SVD), Pseudoinverse.

Laboratory exercise: Implement matlab (/Julia) code for solving numerical problems of linear algebra.

4. TEACHING AND LEARNING METHODS - ASSESSMENT

<p>TEACHING METHOD <i>Face-to-face, Distance learning, etc.</i></p>	Lectures (face to face)	
<p>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES <i>Use of ICT in teaching, laboratory education, communication with students</i></p>	<ul style="list-style-type: none"> ✓ PowerPoint slides. ✓ Support Learning through the eClass platform. 	
<p>TEACHING ORGANIZATION <i>The manner and methods of teaching are described in detail.</i></p> <p><i>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.</i></p> <p><i>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</i></p>	Activity	Semester workload
	Lectures	26
	Laboratory exercises	26
	Solving 4-5 exercises	30
	Study for midterm examination	30
	Midterm examination	2
	Study for Final examination	33
	Final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	150	
<p>STUDENT ASSESMENT <i>Description of the evaluation procedure</i></p> <p><i>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other</i></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students</i></p>	<p>Assessment Language: Greek Assessment Language for Erasmus students: English</p> <p>Assessment methods</p> <ul style="list-style-type: none"> ✓ Written examination: 60% ✓ Laboratory examination: 15% ✓ Exercises: 10% ✓ Mid-term examination: 15% <p>Minimum passing grade: 5 Maximum passing grade: 10</p>	

5. RECOMMENDED LITERATURE

(in Greek)

- Laub Alan J. *Ανάλυση Μητρών για Επιστήμονες και Μηχανικούς*. Εκδόσεις Κλειδάριθμος, 2010.
- Καραγιαννάκης Δημήτριος. *Αριθμητική Γραμμική Άλγεβρα*. Εκδόσεις Διζίγμα, 2014.
- Golub Gene H. and Van Loan Charles F. *Θεωρία και Υπολογισμοί Μητρώων*. Πεδίο Εκδοτική, 2015.

(in English)

- Ford William. *Numerical Linear Algebra with Applications, Using MATLAB*. Elsevier, [free online version](#).