COURSE OUTLINE

(1) GENERAL

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACADEMIC UNIT</td>
<td>Department of Computer Engineering and Informatics</td>
</tr>
<tr>
<td>LEVEL OF STUDIES</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>COURSE CODE</td>
<td>CEID_NY110</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>2nd</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Linear Algebra</td>
</tr>
</tbody>
</table>

INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures, Tutorials</td>
<td>3 (L), 2 (T)</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).

COURSE TYPE

Special background, skills development

PREREQUISITE COURSES:

None

LANGUAGE OF INSTRUCTION and EXAMINATIONS:

Greek (the course may be offered in English for Erasmus students).

IS THE COURSE OFFERED TO ERASMUS STUDENTS:

Yes

COURSE WEBSITE (URL)

https://eclass.upatras.gr/courses/CEID1045/

(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

Today many problems in Computer Science/Technology and Informatics are modeled and solved with theoretical tools and algorithms of Linear Algebra. The course aims to make students familiar with the subject, and emphasis is given to the use and application of the tools and methods of Linear Algebra to the subject of Computer Engineering and Informatics.

Upon conclusion of the course the students ought to be able:

- To interpret the method of solving a linear system as a geometric problem.
- To view the product of a matrix with a vector through linear combinations or inner products.
- To perform matrix operations and recognize whether such an operation is feasible or not.
- To solve linear systems by Gauss elimination or LU decomposition, and find the inverse matrix, whenever exists, with these methods.
- To know the meaning of linear dependence and linear independence.
- To know the meaning of vector space, vector subspace, and vector subspace spanned by vectors.
- To be familiar with the notion of a basis and dimension of a linear space.
To know the four subspaces formed by a matrix and to be able to find them in reasonable cases.

To be able to recognize and invert orthogonal matrices.

To know and find the matrix of an orthogonal projection.

To solve least square linear problems using normal equations and know the characteristics and the geometric meaning of the solution.

To find eigenvalues and eigenvectors of small square matrices and know how to diagonalize matrices and when this is possible.

To know what singular value decomposition is, what a pseudo-inverse of a matrix is, and the role they play in constructing the subspaces formed by a matrix.

To know when a map-transformation is linear and to find the associated matrix.

To find the change of basis matrix.

**General Competences**

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.
- Showing social, professional and ethical responsibility and sensitivity to gender issues.
- Criticism and self-criticism.
- Production of free, creative and inductive thinking.
- Others...

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

Adapting to new situations.

Decision-making.

Production of new research ideas.

(3) **SYLLABUS**

Vectors and vector algebra in the plane and space. Geometric meaning of solving linear systems.


(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<thead>
<tr>
<th>DELIVERY</th>
<th>Face to face.</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td>
<td>The course makes heavy use of the facilities offered by the e-Class environment. All course notes and transparencies are placed online, as well as problem sets, and pointers to the relevant literature.</td>
</tr>
</tbody>
</table>

#### TEACHING METHODS

The manner and methods of teaching are described in detail.

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.

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

<table>
<thead>
<tr>
<th>Activity</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>3*13=39</td>
</tr>
<tr>
<td>Tutorials (exercise sessions)</td>
<td>2*13=26</td>
</tr>
<tr>
<td>Solving exercises</td>
<td>4*13=52</td>
</tr>
<tr>
<td>Non-guided study</td>
<td>2*13=26</td>
</tr>
<tr>
<td>Final Exam</td>
<td>3</td>
</tr>
</tbody>
</table>

Course total 146

#### STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure

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, etc.

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.

The language of evaluation is Greek (English in the case of attendance by foreign students).

**Method of evaluation:** The final grade is based 100% on performance on the final written examination.

**Grading scale 0-10.**

Passing grade greater than or equal to 5.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

2. Γ. Δονάτος & Μ. Αδάμ, Γραμμική Άλγεβρα: Θεωρία και Εφαρμογές, Gutenberg, Αθήνα 2008.

Books 1. and 3. are translations (in Greek) of the texts by Gilbert Strang, “Linear Algebra” 3rd edition, and “Linear Algebra and its Applications” 4th edition, respectively. Newer editions of the original books can also be used.

- Related academic journals: