COURSE OUTLINE

(1) GENERAL

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>SCHOOL OF ENGINEERING</th>
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<tbody>
<tr>
<td>ACADEMIC UNIT</td>
<td>COMPUTER ENGINEERING AND INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDIES</td>
<td>Undergraduate OBLIGATORY</td>
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<tr>
<td>COURSE CODE</td>
<td>CEID_NY233</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>EASTER (4th)</td>
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**INDEPENDENT TEACHING ACTIVITIES**

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.

<table>
<thead>
<tr>
<th>Lectures, Laboratory Exercises, Recitation sections</th>
<th>3(L)2(LE)1(RS)</th>
</tr>
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<tbody>
<tr>
<td><strong>TOTAL</strong></td>
<td>6</td>
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</table>

**COURSE TITLE**

DATA STRUCTURES

**COURSE TYPE**

specialised general knowledge,

**PREREQUISITE COURSES:**

There are no prerequisite courses. It is however recommended that students have at least a basic knowledge of Mathematics (CEID_NY101, CEID_NY102, CEID_NY109), Algorithms (CEID_NY131) and Programming (CEID_NY205).

**LANGUAGE OF INSTRUCTION and EXAMINATIONS:**

Greek. Instruction may be given in English if foreign students attend the course.

**IS THE COURSE OFFERED TO ERASMUS STUDENTS**

YES

**COURSE WEBSITE (URL)**

https://mmlab.ceid.upatras.gr/el/lessons/undergraduate/95-data-structures

https://eclass.upatras.gr/courses/CEID1158/

(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

At the end of this course the student will be able:

1. to present the basic data structuring principles and the elementary data structures.
2. To design and implement data structure.
3. Apply methodologically and cooperatively data structures for solving difficult algorithmic problems.

At the end of the course the student will have further developed the following skills/competences:

1. ability to exhibit knowledge and understanding of elementary data structures
2. ability to apply methodologically this knowledge in order to understand and solve difficult algorithmic problems.
3. Ability to cooperate with others in order to solve difficult programming problems using data structures

**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, Project planning and management
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

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

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Decision-making
Working independently
Team work
Project planning and management
Criticism and self-criticism
Production of free, creative and inductive thinking

(3) SYLLABUS

Searching and sorting in main memory, Bubblesort, Heapsort and analysis of its complexity, Quicksort and analysis of its complexity, sorting in secondary memory, structured data types, array, record, file, heaps and queues, priority queues, lists, trees. Linear Median algorithm. Dictionary problem, Implicit data structures, Binary search, Interpolation-sorting, Binary Interpolation-search, Interpolation-ψάξιμο for unknown non uniform distributions. Dynamic implicit data structures, explicit data structures. balanced trees, AVL-tree, Red-Black Tree or BB-tree, BB[a] tree, Hybrid data structures, Tries, dynamic Interpolation search, interpolation search tree (IST), Interpolation search tree searching. Union-find, Hashing, Hashing with chaining, time and space complexities, Open addressing, Extendible Hashing

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY
Face-to-face, Distance learning, etc.

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students

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

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, other

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

<table>
<thead>
<tr>
<th>Activity</th>
<th>Semester workload</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>90</td>
</tr>
<tr>
<td>Recitation</td>
<td>30</td>
</tr>
<tr>
<td>Project</td>
<td>60</td>
</tr>
<tr>
<td>Course total</td>
<td>180</td>
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</tbody>
</table>

We use Information and Communications Technology in communication with students. We use e_class, e_mail, forum. The course has a web site.

(1) Written examination (100% of the final grade)
(2) Project (can add as bonus 1,5 to the final grade; its completion is obligatory to pass the exams).
(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

2. Μποζάνης Παναγιώτης, Δομές Δεδομένων, 2η Έκδοση, Εκδόσεις Α. Τζιολα & Υιοι, ΑΕ 2016

- Related academic journals: