COURSE OUTLINE

1. GENERAL

SCHOOL	SCHOOL OF ENGINEERING, UNIVERSITY OF PATRAS		
DEPARTMENT	DEPARTMENT OF COMPUTER ENGINEERING AND INFORMATICS		
LEVEL OF COURSE	UNDERGRADUATE, COMPULSORY		
COURSE CODE	CEID_23Y210	**SEMESTER OF STUDIES**	WINTER (4)
COURSE TITLE	DATA STRUCTURES		

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 thewhole of the course, give the weekly teaching hours and the total credits*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures	3	3
Recitation sections	1	1
Laboratory Exercises	2	2
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).	TOTAL	6

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Skills development in Scientific area
PREREQUISITE COURSES:	There are no prerequisite courses. It is however recommended that students have at least a basic knowledge of Mathematics (CEID_22Y105, CEID_23Y201, CEID_23Y204) Algorithms (CEID_23Y205) and Programming (CEID_22Y103, CEID_23Y106).
TEACHING AND ASSESSMENT LANGUAGE:	Greek. Instruction may be given in English if foreign students attend the course.
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/CEID1158/

2. LEARNING OUTCOMES

Leraning 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 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 *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 Adapting to new situations* *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 Working in an* *Others…*

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. COURSE CONTENT

Basic concepts of complexity (space and time complexities, amortized complexity). 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-searching. Binary Interpolation-search. Interpolation-search for unknown non uniform distributions. Dynamic implicit data structures, explicit data structures. Balanced trees: AVL-tree, Red-Black Tree or BB- tree, BB[α] tree, (a,b)-trees. Hybrid data structures, Tries, dynamic Interpolation search, interpolation search tree (IST), interpolation search tree searching. Union-find, Hashing, Hashing with chaining, Open addressing, Extendible Hashing, Secondary memory indexing. Persistent data structures, data structures in the RAM model of computation (Van Emde Boas tree and indexing structures for large word sizes).

4. TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING METHOD *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in teaching, laboratory education, communication with students*	We use Information and Communications Technology in communication with students. E_class and e_mail are used in order to communicate with the students.
TEACHING ORGANIZATION *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*	

Δραστηριότητα	***Φόρτος Εργασίας Εξαμήνου***
Lectures	90
Recitation sections	30
Laboratory exercises	60
Total number of hours for the Course	180

STUDENT ASSESSEMNT *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*	(1) Written examination (70% of the final grade) (2) Project (30% of the final grade, in groups of 1-4 students; the project grade participates only if the written examination grade is >=5). The above holds only for students of the 4th semester. Students of larger semesters give only the written examination.

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.*	

5. RECOMMENDED LITERATURE

- Mark Weiss, Data Structures & Algorithm Analysis in C++, 4th Edition 2013, Pearson
- Μποζάνης Παναγιώτης Δ. Δομές Δεδομένων, 2η Έκδοση, 3η Έκδοση/2022 ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.
- Kurt Mehlhorn, Peter Sanders, Algorithms and Data Structures: The Basic Toolbox, 1st editon 2008, Springer.
- Γεωργακόπουλος Γ.Φ., Δομές Δεδομένων, 1η/2008, ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ & ΕΡΕΥΝΑΣ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ
- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to algorithms, 4th edition, 2022.