

COURSE OUTLINE

GENERAL

SCHOOL	School of Science		
ACADEMIC UNIT	Department of Mathematics		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	MAE641	SEMESTER	6
COURSE TITLE	Design and Analysis of Algorithms		
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>		WEEKLY TEACHING HOURS	CREDITS
lectures, laboratory exercises, tutorials, quiz		3	3
<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>	Special background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	http://www.cs.uoi.gr/~charis/algo641/ http://ecourse.uoi.gr/course/view.php?id=538		

LEARNING OUTCOMES

Learning outcomes <i>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.</i> <i>Consult Appendix A</i> <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i> <i>Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i> <i>Guidelines for writing Learning Outcomes</i>
This course aims at introducing to students the philosophy of fundamental algorithmic background and techniques.

After successfully passing this course the students will be able to:

- Understand basic algorithmic techniques
- Analyze complex algorithms
- Design new algorithmic tools
- Combine already-known techniques for solving new algorithmic problems

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

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 for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Team work
- Project planning and management

SYLLABUS

- Fundamental concepts of design and analysis of algorithms
- Analysis of algorithms, Asymptotical growing functions
- Typical running times and data structures (lists, arrays, queues, stacks)
- Stable matching, correctness, priority queue
- «Divide & Conquer» technique, sorting, recursive formulations
- Graph algorithms: BFS, DFS, connectedness, topological ordering
- Greedy algorithms: interval scheduling & shortest paths (Dijkstra)
- Minimum spanning trees(Prim & Kruskal algorithms), Huffman coding
- Dynamic programming: maximum flow, interval scheduling, and Knapsack
- Further Topics: computational complexity and NP-completeness

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Lectures	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	• Use of projector and interactive board during lectures. • Course website maintenance. Announcements and posting of teaching material (lecture slides and notes, programs). • Announcement of assessment marks via the ecourse platform by UOI.	
TEACHING METHODS <i>The manner and methods of teaching are described in detail.</i>	Activity	Semester workload
	Lectures	40
	Working independently	15

<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> <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>	Team work	15
	Presentation	5
	Course total	75
STUDENT PERFORMANCE EVALUATION <i>Description of the evaluation procedure</i> <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> <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i>	• Final written examination (70%) • Design and analyze algorithms • Exercises (30%) • Design and analyze algorithms	

ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

- *Related academic journals:*

[KT] J. Kleinberg and E. Tardos, Σχεδιασμός Αλγορίθμων, ελληνική έκδοση, Εκδόσεις Κλειδάριθμος, 2008

[CLRS] T. Cormen, C. Leiserson, R. Rivest, and C. Stein, Εισαγωγή στους Αλγορίθμους, ελληνική έκδοση, Πανεπιστημιακές Εκδόσεις Κρήτης, 2012.

[DPV] S. Dasgupta, C. Papadimitriou, and U. Vazirani, Αλγόριθμοι, ελληνική έκδοση, Εκδόσεις Κλειδάριθμος, 2008