INSTITUTION	NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS						
SCHOOL	SCHOOL OF SCIENCE						
DEPARTMENT	INFORMATICS AND TELECOMMUNICATIONS						
COURSE LEVEL	UNDERGRADUATE						
COURSE TITLE	**Algorithms and Complexity**						
COURSE CODE	**K17**		**Semester**	**4**	**ECTS**	**8**	
TEACHING HOURS per week	**THEORY**	**4**	**SEMINAR.**	**2**	**LABORATORY**		
COURSE TYPE	Compulsory (YM)						

K	**E1**	**E2**	**E3**	**E4**	**E5**	**E6**

URL	https://eclass.uoa.gr/courses/D469/
EXPECTED PRIOR KNOWLEDGE/ PREREQUISITES AND PREPARATION:	Data Structures and Programming Techniques K08, Discrete Mathematics K09
TEACHING AND EXAMINATIONS LANGUAGE:	GREEK
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES

COURSE CONTENT
The course introduces the concepts of algorithm design and analysis and presents the basic mathematical tools used to evaluate its performance. It describes the union and find technique and presents the fundamental techniques of search in graphs, BFS and DFS. The course focuses on the three basic methods of algorithm design, "divide and conquer", greedy algorithms and dynamic programming. It analyzes the characteristics of each method and highlights the practical problems that are effectively solved by each method. It defines the decision problems and the classes P and NP. It describes the concept of the reduction and identifies NP-complete and NP-hard problems.

STUDENT LEARNING OBJECTIVES

Teaching-Learning Goals-Expected Learning Outcomes
Introduces students to basic algorithm design techniques. Provides students with tools for evaluating the performance of algorithms and choosing the most appropriate algorithm to solve a practical problem. Aids students to appreciate the role of algorithms in computer science.

Upon successful completion of the course the student will be able to:

- describe algorithms in pseudocode
- specify the asymptotic evaluation of the running time of an algorithm
- compare the performance of two algorithms
- assess the suitability of an algorithm for a problem
- use the basic algorithmic problem-solving techniques
- recognize the difficulty of resolving efficiently some practical problems
- give examples of problems that are characterized as easy and problems that are characterized as difficult
- describe the three algorithm design methods: "divide and conquer", greediness and dynamic programming.
- give specific examples for each method: merge sort, quick sort, activity selection, shortest paths, 0-1 knapsack, longest paths in DAG's, longest common subsequence
- efficiently check connectivity in a graph and find optimally connected components
- give examples of problems that are NP-complete

TEACHING AND LEARNING METHODS - ASSESSMENT	
TEACHING METHOD	In Class (Face to Face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Learning process supported by the e-class platform: course description, provision of material, announcements, assignments and upload Contact via e-mail Live transmission of lectures Ability to track recorded lectures
TEACHING ORGANIZATION *Describe in detail the way and methods of teaching:* *Enhanced Lectures,* *Online Lectures,* *Seminars,* *Tutorial,* *Laboratory,* *Laboratory Exercise,* *Study & analysis of literature,* *Practice (Positioning),* *Interactive teaching,* *Developing a project,* *Individual / group work* *Telework (reference to tools) etc.* *Details of the student's study hours for each learning activity and hours of non-guided study are shown to ensure that the total workload at the semester corresponds to the ECTS*	Use of slides in lectures. There are 3 individual assignments focusing on 1) asymptotic complexity, 2) the "divide and conquer" technique and greedy algorithms, and 3) dynamic programming.

Activity	***Student Workload*** *(hours)*
Lectures (in class)	52
Tutorial (in class)	26
Assignment 1 (individual)	26
Assignment 2 (individual)	26
Assignment 3 (individual)	26
Final written exam	44
Total Course	***200***

	(25 hours of workload per unit of credit)	

ASSESSMENT OF STUDENTS

Description of the assessment process

Assessment Methods, Formative or Concluding, Multiple Choice Test, Quick Response Questions, Test Development Questions, Problem Solving, Written Work, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Other / Other

Fully defined evaluation criteria are mentioned and if and where they are accessible to students.

Students are assessed with 3 assignments and a final written exam.

Assessment methods	***Number***	***Percentage***
Written examination	1	85%
Assignments	3	15%

Evaluation criteria are accessible to students through e-class.

LITERATURE AND STUDY MATERIALS / READING LIST

1. Th. H. Cormen, CH. E. Leiserson, R. L. Rivest and C. Stein, Introduction to algorithms, MIT-Press, 2009, 3rd edition, MIT Press, http://mitpress.mit.edu/algorithms/ (Eudoxus).

2. Jon Kleinberg & Eva Tardos, Algorithm Design, Addison – Wesley, 2006 (Eudoxus).

3. S. Dasgupta, C. H. Papadimitriou & U. V. Vazirani, Algorithms, McGraw-Hill, 2008 (Eudoxus)

• Other material:

- notes, Algorithms and Complexity, 2016,
https://eclass.uoa.gr/modules/document/index.php?course=D469&openDir=/4c2b32c4z3e6

- slides,
https://eclass.uoa.gr/modules/document/index.php?course=D469&openDir=/4c2b32c4rt6n