INSTITUTION	NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS					
SCHOOL	SCHOOL OF SCIENCE					
DEPARTMENT	INFORMATICS AND TELECOMMUNICATIONS					
COURSE LEVEL	UNDERGRADUATE					
COURSE TITLE	**Computational Complexity**					
COURSE CODE	**ΘΠ20**		**Semester**	**7**	**ECTS**	**6**
TEACHING HOURS per week	**THEORY**	**3**	**SEMINAR**	**1**	**LABORATORY**	
COURSE TYPE	**Select one of the following and delete the rest** Electives (ΠΜ) **K**: A **E1**: B **E2**: **E3**: **E4**: **E5**: **E6**: *Fill the table as in the curriculum: Track (A-Computer Science, B- Computer Engineering) / Specialization Compulsory (Y) / Core Specialization (B)/ Elective Specialization (E)*					
URL	https://eclass.uoa.gr/courses/DI436/					
EXPECTED PRIOR KNOWLEDGE/ PREREQUISITES AND PREPARATION:	K25 Theory of Computation					
TEACHING AND EXAMINATIONS LANGUAGE:	GREEK					
THE COURSE IS OFFERED TO ERASMUS STUDENTS	NO					

COURSE CONTENT
Turing Machines(T.M.) (T.M. with multiple tapes, Non-Deterministic T.M.). Church-Turing Thesis. Difference in Complexity of T.M., T.M. with multiple tapes and Non-Deterministic T.M.. Time Complexity of Non-Deterministic T.M.. The class P. The class NP. Syntactic Definition of NP. The class CO-NP. The class EXP. Reductions and Completeness, the notion of NP-Completeness. Cook-Levin Theorem. NP-Complete Languages. Pseudo-Polynomial Algorithms and Strongly NP-Complete Languages. Savitch Theorem. The class PSPACE. PSPACE-Completeness. The classes L, NL and EXPSPACE. NL-Completeness. Space Hierarchy Theorem. Time Hierarchy Theorem.

STUDENT LEARNING OBJECTIVES
Teaching-Learning Goals-Expected Learning Outcomes Upon successful completion of the course the student will be able to: • Formally express Computational Problems and encode them as Languages of a certain alphabet. • Classify languages into Time and Space Complexity classes. • Devise and write rigorously mathematical proofs concerning the Time or Space Complexity of a Language, as well as to implement Reductions for this (such as Polynomial-time and Logarithmic-space Reductions).

<table>
<tr><th colspan="2">TEACHING AND LEARNING METHODS - ASSESSMENT</th></tr>
<tr><td>TEACHING METHOD</td><td>In Class (Face to Face)</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES</td><td>Learning process supported by the e-class platform (Teaching material; Announcements; Task assignments; Outside links etc)
Email communication.</td></tr>
<tr><td>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</td><td>
<table>
<tr><th>Activity</th><th>Student Workload
(hours)</th></tr>
<tr><td>Lectures (physical presence)</td><td>39</td></tr>
<tr><td>Seminars (physical presence)</td><td>13</td></tr>
<tr><td>Independent study and analysis of literature</td><td>70</td></tr>
<tr><td>Seminary preparation</td><td>13</td></tr>
<tr><td>Homeworks</td><td>15</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Total Course
(25 hours of workload per unit of credit)</td><td>150</td></tr>
</table>

Extensive use of the blackboard. Emphasis is placed on examples and problem solving. Homeworks are individual or in groups of 3.</td></tr>
</table>

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.*	Evaluation by written examination and homework assignments. Grade Feedback is available upon request. **Assessment methods** / ***Number*** / ***Percentage*** Written examination: 1: 80% Exercises: 1-2: 20%

LITERATURE AND STUDY MATERIALS / READING LIST

- Michael Sipser, Εισαγωγή στην Θεωρία Υπολογισμού, Πανεπιστημιακές Εκδόσεις Κρήτης 2007
- Harry R. Lewis, Χρήστος Παπαδημητρίου: Στοιχεία Θεωρίας Υπολογισμού, Εκδόσεις Κριτική 2005
- Christos H. Papadimitriou: Computational Complexity, Pearson publications 1993
- Michael R. Garey, David S. Johnson: Computers and Intractability: A Guide to the Theory of NP-completeness, W. H. Freeman and Company 1979
- Sanjeev Arora and Boaz Barak: Computational Complexity: A Modern Approach, Cambridge University Press 2007
- John E Hopcroft, Rajeev Motwani, Jeffrey D Ullman: Introduction to automata theory, languages, and computation, Addison-Wesley 1979