COURSE OUTLINE

GENERAL

SCHOOL	Sciences and Engineering		
ACADEMIC UNIT	Computer Science		
LEVEL OF STUDIES	1st Cycle		
COURSE CODE	COMP-321	**SEMESTER**	Fall
COURSE TITLE	Theory of Computation		

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*	**WEEKLY TEACHING HOURS**	**CREDITS**
	2.5	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special background
PREREQUISITE COURSES:	COMP-270
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	
COURSE WEBSITE (URL)	

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*

After completion of the course students are expected to be able to:

- apply techniques to construct finite state machines and regular expressions
- apply techniques to design context-free languages
- design a (non)deterministic finite-state machine to accept a specified language
- explain how some problems have no algorithmic solution
- analyze examples that illustrate the concept of uncomputability
- prove that a language is in a specified class and that it is not in the next lower class.
- apply techniques to convert among equivalently powerful notations for a language, including among DFAs, NFAs, and regular expressions, and between PDAs and CFGs

- analyze the Church-Turing thesis and its significance
- discuss the Halting Problem
- demonstrate the usage of reductions to decide if a problem is solvable or insolvable
- analyze class P, class NP, NP-complete 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
Adapting to new situations
Decision-making
Working independently
Production of free, creative and inductive thinking

SYLLABUS

1. Automata and Languages
    a. Regular Languages
        i. Finite Automata (FA)
        ii. Deterministic FA and Nondeterministic FA
        iii. Regular Expressions and Languages
    b. Context-free Grammars and Languages
        i. Context-free Grammars
        ii. Pushdown Automata (PDAs)
        iii. Non-Context-Free Languages
2. Computability Theory
    a. The Church-Turing Thesis
        i. Turing Machines
        ii. Variants of Turing Machines
    b. Decidability
        i. Decidable Languages
        ii. Diagonalization
        iii. The Halting Problem
    c. Reducibility
        i. Reductions
3. Complexity Theory
    a. Time complexity (class P, class NP, NP-completeness)

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td><b>DELIVERY</b>
<i>Face-to-face, Distance learning, etc.</i></td><td>Face-to-face</td></tr>
<tr><td><b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b>
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td><i>Use of ICT in teaching / Χρήση ΤΠΕ</i>
<i>Communication with students / Επικοινωνία με Φοιτητές</i></td></tr>
<tr><td><b>TEACHING METHODS</b>
<i>The manner and methods of teaching are described in detail.</i>
<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></td><td>
<table>
<tr><th><b><i>Activity</i></b></th><th><b><i>Semester workload</i></b></th></tr>
<tr><td>Lectures</td><td>35</td></tr>
<tr><td>Preparation, assignments</td><td>77</td></tr>
<tr><td>Exam Preparation</td><td>36</td></tr>
<tr><td>Final Exam</td><td>2</td></tr>
<tr><td>Course total</td><td><b><i>150</i></b></td></tr>
</table>
</td></tr>
<tr><td><b>STUDENT PERFORMANCE EVALUATION</b>
<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></td><td>Final Exam, Midterm Exam, and Assignments</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Introduction to Automata Theory, Languages, and Computation (3rd Ed.)	John Hopcroft, Rajeev Motwani, Jeffrey Ullman	Pearson	2006	978-0321455369

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Introduction to the Theory of Computation	William A. Goddard	Jones & Bartlett Publishers	2008	978-0763741259

Introduction to the Theory of Computation (3rd Ed.)	Michael Sipser	Course Technology	2012	978-1133187813