Course unit title:	Theory of Computation
Course unit code:	CSC401
Type of course unit: **(Compulsory/optional)**	Compulsory (Foundation)
Level of course unit: **(First, second or third cycle)**	Bachelor (1st cycle)
Year of study:	4
Semester when the unit is delivered:	7
Number of ECTS credits allocated:	6
Name of lecturer(s):	TBA

Learning outcomes of the course unit:

Upon succesful completion of this course students should be able to:

- Describe and explain the operation and limitations of various computational models.
- Create models of Deterministic and Non-Deterministic Finite Automatons, Push-Down Automatons for various languages
- Apply various forms of the pumping lemma in proofs.
- Create models of Turing Machines for computational problems
- Define the classes P, NP and describe NP-completeness
- Explain and use polynomial time reductions

Mode of delivery:	Face- to- face
Prerequisites and co-requisites:	CSC205
Recommended optional program components:	None

Course Contents:

Objective:
To provide students with techniques useful in a wide variety of applications and develop a way of thinking that leads to understanding of the structure, behavior, limitations and capabilities of logical machines.

Description:

Review:
Basic algebraic concepts: sets, functions, mappings, binary operators, relations, partially ordered sets, equivalence classes. Introduction to alphabets and languages

Finite Automata:
Deterministic finite automata, Non-Deterministic finite automata. Equivalence of Deterministic and non-deterministic finite automata. Properties of languages accepted by finite automata, finite automata and regular expressions. Regular and non-regular languages (proof). Reduction of number of states in finite automata. Pushdown automata.

Languages and Grammars:
Properties of regular grammars and languages, The pigeonhole principle, A pumping Lemma. Context-free languages, derivation trees, pushdown automata and context-free grammars. Closure, periodicity, algorithmic properties. Transformation of grammars (Useless Productions, lambda, unit productions), Normal forms (Chomsky, Greibach), membership.

Turing Machines:
Definition, computing with Turing machines, Turing machine extensions, Nondeterministic Turing machines, Turing's Thesis.

Computational Complexity:
Rate of Growth, tie-bounded machines, NP-completeness

Recommended or required reading:	Lewis, R., Papadimitriou H., ELEMENTS OF THE THEORY OF COMPUTATION, Prentice-Hall Sipser, M., INTRODUCTION TO THE THEORY OF COMPUTATION, PWS Publishing Company Hopcroft J., Motwani R., Ullman J., INTRODUCTION TO AUTOMATA THEORY, LANGUAGES, AND COMPUTATION, Addison-Wesley, Third edition D. I. A. Cohen, INTRODUCTION TO COMPUTER THEORY, 2nd Ed., Wiley, 1997
Planned learning activities and teaching methods:	Class Instruction 42 Hours Consultation/Computer Lab 15 Hours

Assessment methods and criteria:	Examinations 75% Assignments/ Class Participation 25% 100%
Language of instruction:	English
Work Placement(s):	No
Place of Teaching:	Theoretical Part: Regular Classroom European University Cyprus, Nicosia Practical Part: Computer Lab European University Cyprus, Nicosia