UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
COMP-321	Theory of Computation	6
Prerequisites	**Department**	**Semester**
COMP-211	Computer Science	Fall
Type of Course	**Field**	**Language of Instruction**
Required	Computer Science	English
Level of Course	**Lecturer(s)**	**Year of Study**
1st Cycle	Dr Ioanna Dionysiou	3rd
Mode of Delivery	**Work Placement**	**Corequisites**
Face-to-face	N/A	None

Course Objectives:

The main objectives of the course are to:

- introduce the basic theoretical principles in Computer Science
- compare and contrast the various types of finite automata
- thoroughly discuss formal definitions of programming languages and their connection with finite automata
- cover in detail Turing machines and computability
- introduce the theoretical understanding of the halting problem.

Learning Outcomes:

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

1. discuss the concept of finite state machines and regular expression
2. explain context-free languages
3. design a deterministic finite-state machine to accept a specified language
4. explain how some problems have no algorithmic solution
5. provide examples that illustrate the concept of uncomputability
6. prove that a language is in a specified class and that it is not in the next lower class.
7. convert among equivalently powerful notations for a language, including among DFAs, NFAs, and regular expressions, and between PDAs and CFGs
8. explain the Church-Turing thesis and its significance
9. summarize the Halting Problem
10. demonstrate the usage of reductions in order to decide if a problem is solvable or

insolvable.

Course Content:

1. Automata and Languages
    a. Regular Languages:
        i. Finite Automata
        ii. Nondeterminism
        iii. Regular Expressions.
    b. Context-free 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

Learning Activities and Teaching Methods:

Lectures, Practical Exercises, and In-class Problem Solving Sessions

Assessment Methods:

Final Exam, Midterm Exam, and Assignments

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Introduction to the Theory of Computation (3rd Ed.)	Michael Sipser	Course Technology	2012	978-1133187813

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 Automata Theory, Languages, and Computation (3rd Ed.)	John Hopcroft, Rajeev Motwani, Jeffrey Ullman	Pearson	2006	978-0321455369