



FREIE UNIVERSITÄT BOZEN

LIBERA UNIVERSITÀ DI BOLZANO

FREE UNIVERSITY OF BOZEN - BOLZANO

Fakultät für Informatik

Facoltà di Scienze e Tecnologie informatiche

Faculty of Computer Science

## COURSE PRESENTATION FORM

<b>COURSE NAME</b>	Theory of Computing
<b>COURSE CODE</b>	70101
<b>LECTURER</b>	Diego Calvanese
<b>TEACHING ASSISTANT</b>	Andrea Calì
<b>TEACHING LANGUAGE</b>	English
<b>CREDIT POINTS</b>	8
<b>LECTURE HOURS</b>	48
<b>EXERCISE HOURS</b>	24
<b>PREREQUISITES</b>	There are no prerequisites in terms of courses to attend. Students should be familiar with notions of mathematics and set theory, and with basic proof techniques, as taught in the mathematics courses of a bachelor in computer science.
<b>OBJECTIVES</b>	The objective of the Theory of Computing course is to introduce and study abstract, mathematical models of computation (such as finite state machines, push down machines, and Turing machines), and to use the abstract machine models to study the ability to solve computational problems, by identifying both the intrinsic limitations of computing devices, and the practical limitations due to limited availability of resources (time and space). A second objective is to show how to reason and prove properties about computing in a precise, formal, abstract way.
<b>SYLLABUS</b>	Finite automata, regular expressions, properties of regular languages, context-free grammars and languages, pushdown automata, Turing Machines, undecidability, computational complexity, NP-completeness, polynomial hierarchy
<b>TEACHING FORMAT</b>	Frontal lectures; exercises in class
<b>ASSESSMENT</b>	Final written examination (100%).
<b>READING LIST</b>	Textbook: <ul style="list-style-type: none"><li>• <i>Introduction to Automata Theory, Languages, and Computation (2<sup>nd</sup> edition)</i>. J.E. Hopcroft, R. Motwani, J.D. Ullman. Addison Wesley, 2003.</li></ul> Further reading material: <ul style="list-style-type: none"><li>• <i>Elements of the Theory of Computation (2<sup>nd</sup> edition)</i>. H.R Lewis, C.H. Papadimitriou. Prentice Hall. 1998.</li><li>• <i>Introduction to the Theory of Computation</i>. M. Sipser. PWS Publishing Company. 1997.</li><li>• <i>Computational Complexity</i>. C.H. Papadimitriou. Addison Wesley. 1995.</li></ul>
<b>SOFTWARE USED</b>	None
<b>LEARNING OUTCOME</b>	After the course, students will know the fundamental models of computation, and the intrinsic and practical limitations of computing devices. They will also be familiar with formal techniques of computer science, and will be able to formally proof properties about computing.