## Course Description - Academic Year 2014/2015

<table>
<thead>
<tr>
<th>Course title</th>
<th>Theory of Computing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course code</td>
<td>72001</td>
</tr>
<tr>
<td>Scientific sector</td>
<td>ING-INF/05</td>
</tr>
<tr>
<td>Degree</td>
<td>Master in Computer Science (LM-18)</td>
</tr>
<tr>
<td>Semester</td>
<td>1</td>
</tr>
<tr>
<td>Year</td>
<td>1</td>
</tr>
<tr>
<td>Credits</td>
<td>8</td>
</tr>
<tr>
<td>Modular</td>
<td>No</td>
</tr>
<tr>
<td>Total lecturing hours</td>
<td>48</td>
</tr>
<tr>
<td>Total lab hours</td>
<td>--</td>
</tr>
<tr>
<td>Total exercise hours</td>
<td>24</td>
</tr>
<tr>
<td>Attendance</td>
<td>Not compulsory</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>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.</td>
</tr>
<tr>
<td>Course page</td>
<td><a href="http://www.inf.unibz.it/~calvanese/teaching/tc/">http://www.inf.unibz.it/~calvanese/teaching/tc/</a></td>
</tr>
</tbody>
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### Specific Educational Objectives

The course belongs to the type "caratterizzanti – discipline informatiche" in the curriculum "Data and Knowledge Engineering".

The objective of the Theory of Computing course is to introduce and study abstract, mathematical models of computation (such as Turing machines, formal grammars, recursive functions), and to use the abstract computation 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 computations in a precise, formal, abstract way.

### Lecturer

Diego Calvanese

### Contact

Piazza Domenicani 3, Room 2.07, calvanese@inf.unibz.it, 0471-016160

### Scientific sector of lecturer

ING-INF/05

### Teaching language

English

### Office hours

During the lecture time span: Friday, 15:00-17:00.

### Teaching Assistant (if any)

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### Contact TA

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### Office hours TA

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### Syllabus

- Formal languages
- Formal grammars
- Turing Machines
- Recursive functions
- Undecidability
- Computational complexity
- NP-completeness
- Time and space complexity classes
## Teaching format
Frontal lectures.

## Learning outcomes

### Knowledge and understanding:
- Thoroughly understand the scientific method of investigation.
- Understand the methods of mathematics and statistics which are of support to information technology and its applications.

### Applying knowledge and understanding:
- Be able to extend or modify a formal calculation model in an original way, taking into account altered conditions or requirements.
- Be able to define an algorithmic solution to a computational problem and to estimate its complexity.

### Ability to make judgments
- Ability to identify reasonable work goals.

### Communication skills
- None.

### Ability to learn
- Students must be able to autonomously extend the knowledge acquired during the study course by reading and understanding scientific and technical documentation mostly in English.
- In the context of a problem-solving activity they must be able to extend even incomplete knowledge taking into account the objective of the project.

## Assessment
The assessment of the course consists of two parts:
- midterm or final exam on the first half of the syllabus (50%);
- final exam on the second half of the syllabus (50%).
Each part of the examination may be either written or oral.

## Assessment language
English

## Evaluation criteria and criteria for awarding marks
At the exam, the student has to solve exercises and answer questions on the course topics in written or oral form. The solution of the exercises requires the ability to apply the notions and techniques studied in the course to novel contexts.

The two parts of the examination can be taken independently of each other within the three exam sessions of an academic year. In case of a positive mark for one of the two parts (obtained at the midterm or at one of the first two regular exam sessions), that part will count for all 3 regular exam sessions.

## Required readings

## Supplementary readings
<table>
<thead>
<tr>
<th>Software used</th>
<th>None.</th>
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