# LINGI1123

*2013-2014*

# Computability and complexity

| 5.0 credits | 30.0 h + 30.0 h | 2q |
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| Teacher(s) : | Deville Yves ; |
| Language : | Français |
| Place of the course | Louvain-la-Neuve |
| Inline resources: | > http://icampus.uclouvain.be/claroline/course/index.php?cid=INGI1123 |
| Prerequisites : | --<br>Advanced algorithmics and data strucutres (e.g. SINF1121)<br>--<br>Thinking using discrete mathematics (e.g. INGI1101) |
| Main themes : | --<br>Computability : problems and algorithms, computable and non computable functions, reductions, undecidable classes of problems (Rice), fix point theorem, Church-Turing thesis<br>--<br> Main computability models : Turing machines, recursive functions, lambda calculus, automates<br>--<br>Complexity theory : complexity classes, NP-completeness, Cook's theorem, how to solve NP-complete problems |
| Aims : | Students completing successfully this course will be able to<br>--<br>recognize, explain and identify the limits of computing science ;<br>--<br>explain the main computability models especially  their foundations, their similarities and their differences<br>--<br>identify, recognize and describe non computable and untractable problems<br>Students will have developed skills and operational methodology. In particular, they have developed their ability to<br>--<br>have a critical look at the performance and capabilities of computer systems<br>*The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".* |
| Evaluation methods : | --<br>written exam (September, oral exam) |
| Teaching methods : | --<br>lectures<br>--<br>exercises supervised by a teaching assistant |
| Content : | --<br>Introduction<br>--<br>Concepts: demonstration and reasoning, sets, Cantor's diagonalization<br>--<br>Computability: basic results<br>--<br>Models of computability<br>--<br>Analysis of the Church-Turing thesis<br>--<br>Introduction to computational complexity<br>--<br>Complexity classes |

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| Bibliography : | Slides online<br>References<br>--<br>O. Ridoux, G. Lesventes.  Calculateurs, calculs, calculabilité. Dunod  Collection Sciences Sup, 224 pages, 2008.<br>--<br>P. Wolper Introduction à la calculabilité 2nd Edition, Dunod, 2001.<br>--<br>Sipser M. Introduction to the Theory of Computation PWS Publishing Company, 1997 |
| Cycle and year of study : | > Master [120] in Mathematical Engineering<br>> Bachelor in Computer Science<br>> Preparatory year for Master in Computer science<br>> Bachelor in Economics and Management<br>> Bachelor in Mathematics<br>> Bachelor in Engineering |
| Faculty or entity in charge: | INFO |