UCL Université catholique de Louvain

LINGI1123

2012-2013

Computability and complexity

5.0 credits	30.0 h + 30.0 h	2q

Teacher(s) :	Deville Yves ;
Language :	Français
Place of the course	Louvain-la-Neuve
Prerequisites :	-- Advanced algorithmics and data strucutres (e.g. SINF1121) -- Thinking using discrete mathematics (e.g. INGI1101)
Main themes :	-- Computability : problems and algorithms, computable and non computable functions, reductions, undecidable classes of problems (Rice), fix point theorem, Church-Turing thesis -- Main computability models : Turing machines, recursive functions, lambda calculus, automates -- 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 -- recognize, explain and identify the limits of computing science ; -- explain the main computability models especially their foundations, their similarities and their differences -- identify, recognize and describe non computable and untractable problems Students will have developed skills and operational methodology. In particular, they have developed their ability to -- have a critical look at the performance and capabilities of computer systems *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 :	-- written exam (September, oral exam) -- 2 formative evaluations (not for the final grade) during the semester
Teaching methods :	-- lectures -- exercises supervised by a teaching assistant
Content :	-- Introduction -- Concepts: demonstration and reasoning, sets, Cantor's diagonalization -- Computability: basic results -- Models of computability -- Analysis of the Church-Turing thesis -- Introduction to computational complexity -- Complexity classes
Bibliography :	Slides online References -- O. Ridoux, G. Lesventes. Calculateurs, calculs, calculabilité. Dunod Collection Sciences Sup, 224 pages, 2008. -- P. Wolper Introduction à la calculabilité 2nd Edition, Dunod, 2001. -- Sipser M. Introduction to the Theory of Computation PWS Publishing Company, 1997
Cycle and year of study :	> Bachelor in Mathematics > Bachelor in Computer Science > Bachelor in Engineering : Architecture > Bachelor in Economics and Management > Bachelor in Mathematics > Bachelor in Engineering > Bachelor in Engineering > Bachelor in Computer Science > Preparatory year for Master in Computer science > Bachelor in Engineering : Architecture > Bachelor in Economics and Management > Master [120] in Mathematical Engineering
Faculty or entity in charge:	INFO