UCL Université catholique de Louvain

LINGI1123

2015-2016

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
Inline resources:	> http://icampus.uclouvain.be/claroline/course/index.php?cid=INGI1123
Prerequisites :	Within SINF1BA : LSINF1101 Within FSA1BA : LFSAB1101, LFSAB1102, LFSAB1202, LFSAB1202, LFSAB1301, LFSAB1401 *The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.*
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 :	Given the learning outcomes of the "Bachelor in Engineering" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes: -- AA1.1, AA1.2 -- AA2.4 Given the learning outcomes of the "Bachelor in Engineering" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes: -- S1.I3, S1.G1 -- S2.2 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)
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
Other infos :	Background: -- SINF1121 Advanced algorithmics and data structures
Faculty or entity in charge:	INFO

Programmes / formations proposant cette unité d'enseignement (UE)

Intitulé du programme	Sigle	Credits	Prerequis	Acquis d'apprentissage
Master [120] in Mathematical Engineering	MAP2M	5	-	
Minor in Computer Sciences	LINFO100I	5	LSINF1101	
Minor in Engineering Sciences: Applied Mathematics	LMAP100I	5	-	
Bachelor in Computer Science	SINF1BA	5	LMAT1111F **and** LMAT1111E **and** LSINF1140 **and** LSINF1101 **and** LSINF1102 **and** LSINF1103	
Additionnal module in Mathematics	LMATH100P	5	-	