UCLouvain

lingi1123

2019

Computability and complexity

In view of the health context linked to the spread of the coronavirus, the methods of organisation and evaluation of the learning units could be adapted in different situations; these possible new methods have been - or will be - communicated by the teachers to the students.

5 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Deville Yves ;
Language :	French
Place of the course	Louvain-la-Neuve
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 Computer science" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes: • S1.I3, S1.G1 • S2.2 1 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	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** • written exam (September, oral exam)
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** • 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 and NP completeness
Inline resources	https://moodleucl.uclouvain.be/course/view.php?id=9095

Bibliography	Livres de référence • 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 containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Mathematical Engineering	MAP2M	5		
Master [60] in Computer Science	SINF2M1	5		
Master [120] in Computer Science	SINF2M	5		
Additionnal module in Mathematics	LMATH100P	5		
Minor in Engineering Sciences: Computer Sciences (only available for reenrolment)	LSINF100I	5		