UCLouvain

linfo1123

2026

Calculability and Complexity

5.00 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Pecheur Charles ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	This course assumes that the student acquired programming skills, algorithmic and programming language targeted in course LEPL1402 and discrete mathematics as seen in courses LINFO1114 or LEPL1108
Main themes	• Theory of computability: problems and algorithms, computable and non-computable functions, reduction, undecidable problem classes (Rice's theorem), fixed point theorem, Church-Turing thesis • Logic: logic of propositions and logic of predicates (syntax, semantics, proof, quantifiers, model checking, resolution) • Computability Models: Turing Machine • Theory of complexity: complexity classes, NP-completeness, Cook's theorem, NP-complete problem solving.
Learning outcomes	**At the end of this learning unit, the student is able to :** 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 Students who have successfully completed this course will be able to: • recognize, explain and identify the limitations of information processing by a computer; • explain and make good use of the main computability models by explaining their bases, differences and similarities; • convert current language assertions into logical expressions using the syntax and semantics of the logic of propositions or predicates; • recognize, identify and apprehend non-calculable problems as well as intrinsically complex problems. Students will have developed methodological and operational skills. In particular, they will have developed their capacity to: • take a critical look at the performance and capacity of computer systems.
Evaluation methods	Different modes of evaluation can be organized: continuous assessment, graded work, participation, exam. The exam will be written, but in case of doubt on the part of the teacher as to the grade to be given to a student, the student may be questioned orally. Depending on the number of studentrs, the September exam can be an oral exam.
Teaching methods	This course can be given in a variety of face-to-face and distance modalities. These may include lectures, readings, preparations, exercises, as well as individual or group work.
Content	• Introduction • Enumerable sets • Computability: fondamenbtal results • Models of computability • Propositional logic • Introduction to algorithmic complexity • Complexity classes
Faculty or entity in charge	INFO

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Additionnal module in Mathematics	APPMATH	5		
Specialization track in Computer Science	FILINFO	5		
Bachelor in Mathematics	MATH1BA	5		
Bachelor in Computer Science	SINF1BA	5		
Mineure Polytechnique	MINPOLY	5		
Master [120] of Education, Section 4 : Mathematics	MATH2M4	5		
Minor in mathematics teaching	APPENSMAT	5		