UCLouvain

linma2111

2019

Discrete mathematics II : Algorithms 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 + 22.5 h	Q1

Teacher(s)	Blondel Vincent ;Delvenne Jean-Charles (coordinator) ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	The course is an introduction to algorithms and their complexity from a non-numerical point of view. The principal topic is the mathematical analysis of the existence of algorithms and their complexity on the classical problems of the field.
Aims	• AA1 : 1,2,3 • AA3 : 1,3 • AA4 : 1 • AA5 : 1,2,3,5,6 At the end of this course the student will be able to : 1 • Study exact and approximate algorithms for combinatorial problems from different viewpoints: design, data structure, performance analysis, existence, complexity. • Apply some general techniques (divide and conquer, dynamic programming, etc.) to solve basic algorithmic problems (e.g. sorting) and perform a worst-case or average-case complexity analysis. • Take initiatives to search information relevant for the analysis of a given problem. • Propose original solutions and compare them to available solutions. • Write a report on the proposed and available solutions. - - - - *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.** The students are evaluated through an individual written exam, on the objectives listed above. Moreover the students write homework papers during the term, which are corrected and commented. The grades for the homework enter the final grade.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** The course is organised in lessons and weekly homework, for which non-compulsory consulting is offered.
Content	Introduction to the basic algorithms for sorting and the efficient implementation of different data structures including an analysis of worst case and average case complexity. Treatment of important algorithm classes including greedy and dynamic programming algorithms. Aspects of complexity theory including NP-completeness, complexity classes and decidability.
Inline resources	http://moodleucl.uclouvain.be/course/view.php?id=5413
Bibliography	• Algorithmics: Theory and Practice, G. Brassard and P. Bratley, Prentice Hall, 1988. • Introduction to Algorithms, T.H. Cormen, C.E. Leierson and R.L. Rivest, MIT Press 1986.
Faculty or entity in charge	MAP

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Mathematical Engineering	MAP2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		