


Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

5 credits	30.0 h + 22.5 h	Q1
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Teacher(s)	Blondel Vincent ;Delvenne Jean-Charles ;Delvenne Jean-Charles (compensates Blondel Vincent) ;
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	<ul style="list-style-type: none"> <li>• AA1 : 1,2,3</li> <li>• AA3 : 1,3</li> <li>• AA4 : 1</li> <li>• AA5 : 1,2,3,5,6</li> </ul> <p>At the end of this course the student will be able to :</p> <p>1</p> <ul style="list-style-type: none"> <li>• Study exact and approximate algorithms for combinatorial problems from different viewpoints: design, data structure, performance analysis, existence, complexity.</li> <li>• 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.</li> <li>• Take initiatives to search information relevant for the analysis of a given problem.</li> <li>• Propose original solutions and compare them to available solutions.</li> <li>• Write a report on the proposed and available solutions.</li> </ul> <p>-----</p> <p><i>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".</i></p>
Evaluation methods	<b>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</b> The students are evaluated through an individual written exam, on the objectives listed above. Moreover the students write homework papers during the term. The grades for the homework enter the final grade.
Teaching methods	<b>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</b> The course is organised in lessons and homework. No compulsory on-site exercise sessions.
Content	a) Illustration on basic algorithms for sorting and the efficient implementation of different data structures of the main concepts of the course, including an analysis of worst case and average case complexity. b) Treatment of important strategies of design of algorithms including divide-and conquer, dynamic programming, greedy methods. c) Probabilistic and quantum algorithms. d) Aspects of complexity theory including NP-completeness, complexity classes (deterministic or probabilistic) and decidability.
Inline resources	<a href="http://moodleucl.uclouvain.be/course/view.php?id=5413">http://moodleucl.uclouvain.be/course/view.php?id=5413</a>
Bibliography	<ul style="list-style-type: none"> <li>• Algorithmics: Theory and Practice, G. Brassard and P. Bratley, Prentice Hall, 1988.</li> <li>• Introduction to Algorithms, T.H. Cormen, C.E. Leieron and R.L. Rivest, MIT Press 1986.</li> </ul>
Faculty or entity in charge	MAP

### Force majeure

Evaluation methods	The exam is written, on site. An exam of adapted form will be proposed to the students with a valid quarantine certificate or a 'formulaire retour' from the Foreign Office, if the teachers (Gautier Krings and Jean-Charles Delvenne) are warned asap and in any case before the main exam. This alternative exam will cover the same topics as the main exam, and will be organised in a form compatible with the situation of the student.
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<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Electrical Engineering	<a href="#">ELEC2M</a>	5		
Master [120] in Mathematical Engineering	<a href="#">MAP2M</a>	5		