UCLouvain

# minfo1302

*2019*

# PROGRAMMING PROJECT

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 + 15.0 h | Q1 |
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| Teacher(s) | Catanzaro Daniele ; |
| Language : | English |
| Place of the course | Mons |
| Prerequisites | • MQANT1110 - Mathématiques de gestion 1<br>• MQANT1227 - Mathématiques de gestion 2<br>• MQANT1329 - Optimisation<br>• MQANT1223 - Informatique et algorithmique<br><br>*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 | This course provides an introduction to mathematical modeling of computational problems. It covers the common algorithms, algorithmic paradigms, and data structures used to solve these problems. The course emphasizes the relationship between algorithms and programming. It pays particular attention on the practical importance of specific classes of optimization problems in management science and motivate the students to develop algorithms to solve them. |
| Aims | This course contributes to develop the following competencies.<br><br>• Knowledge<br>• Scientific reasoning and systematic approach<br>• Project management<br>• Leadership<br>1<br><br>At the end of this course, students will:<br><br>• Improve their strategical thinking skills<br>• Acquire fundamental knowledge on the modeling and the resolution of practical problems<br>• Apply the appropriate techniques to propose a useful solution.<br><br>- - - -<br>*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.**<br>Continuous evaluation, including an individual project with final exam. Due to the particular nature of this course, the evaluation will consists of **only one** exam per year. Depending upon the academic calendar, the scheudling of such exam may vary from year to year and will be communicated by the lecturer in charge during the first (and mandatory) lecture of the course. |
| Teaching methods | **Due to the COVID-19 crisis, the information in this section is particularly likely to change.**<br>Blackboard lectures. |
| Content | This course provides an introduction to algorithmic problem solving. Its main goal is to learn how to implement solution approaches for different type of problems involving search and optimization features. It covers the introduction to graph theory, classical algorithms on graphs, algorithmic paradigms, and data structures used to solve these problems. The course emphasizes the relationship between algorithms and programming. It pays attention on the practical importance of specific classes of optimization problems in management science and motivate the students to develop algorithms to solve them.<br>The course includes in particular the following topics:<br><br>1. Recursion<br>2. Fundation of data structures: Graphes<br>3. Basic algorithms on graphs<br>4. Well Solved Optimization Problems in Management Science - Part I: Spanning Trees<br>5. Well Solved Optimization Problems in Management Science - Part II: Shortest Paths |

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| | 6. Hard Optimization Problems in Management Science - Part I - Spanning Trees with constraints<br>7. Hard Optimization Problems in Management Science - Part I - Shortest Paths with constraints<br>8. Finding the optimum via Branch-&-Bound<br>9. Introduction to Heuristics, Local Searches and Metaheuristics |
| Inline resources | 1. Online resources for "Introduction to Algorithms".<br>2. Online resources for "Thinking in Java". |
| Bibliography | The lectures will be integrated with some capita selecta from the following references: (1) Cormen, Thomas, Charles Leiserson, Ronald Rivest, and Clifford Stein. Introduction to Algorithms. 3rd ed. MIT Press, 2009; (2) B, Eckel. Thinking in Java, 4th Edition. Prentice Hall, 2006. (3) L. Wolsey. Integer Programming, Wiley, 1998. (4) M. Gendreau and J. Y. Potvin. Handbook of Metaheuristics. Springer, 2010. |
| Faculty or entity in charge | CLSM |

| Programmes containing this learning unit (UE) | | | | |
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| Program title | Acronym | Credits | Prerequisite | Aims |
| Bachelor : Business Engineering | INGM1BA | 5 | MINFO1201 AND MQANT1227 | 🔍 |