UCLouvain

# linma1702

*2019*

# Optimization models and methods I

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 | Q2 |
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| Teacher(s) | Glineur François ; |
| Language : | French |
| Place of the course | Louvain-la-Neuve |
| Aims | *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>Students will be evaluated with an individual written exam, based on the above-mentioned objectives. Students also carry out a project in small groups, whose evaluation is taken into account for the final grade. |
| Teaching methods | **Due to the COVID-19 crisis, the information in this section is particularly likely to change.**<br>This course is comprised of lectures, exercise sessions and computer labs, as well as a project to be carried out in small groups. Consulting is available for help with the project. |
| Content | **Linear optimization:**<br>Introduction, canonical formulations, polyhedral geometry, simplex algorithm, duality et sensitivity analysis, introduction to discrete optimization (branch & bound).<br>**Nonlinear optimization:**<br>*Models :* definitions and terminology, optimality conditions for unconstrained and constrained problems ; recognize and exploit convexity of a problem.<br>*Methods :* line-search methods for unconstrained problems (gradient, Newton and quasi-Newton methods) ; convergence properties (local and global) ; implementation details ; introduction to other types of methods. |
| Inline resources | Course documents (slides, notes and exercises) are available on Moodle : https://moodleucl.uclouvain.be/course/view.php?id=9200 |
| Bibliography | • Introduction to Linear Optimization, Dimitri Bertsimas and John Tsitsiklis, Athena Scientific, 1997.<br>• Linear Programming. Foundation and Extensions, Robert Vanderbei, Kluwer Academic Publishers, 1996.<br>• Integer Programming, Laurence Wolsey, Wiley, 1998.<br>• Numerical Optimization, Jorge Nocedal et Stephen J. Wright, Springer, 2006.<br>• Convex Optimization, Stephen Boyd et Lieven Vandenberghe, Cambridge University Press, 2004. |
| Faculty or entity in charge | MAP |

## Programmes containing this learning unit (UE)

| Program title | Acronym | Credits | Prerequisite | Aims |
|---|---|---|---|---|
| Approfondissement en statistique et sciences des données | LSTAT100P | 5 | | |
| Additional module in computer science | LSINF110P | 5 | | |
| Additionnal module in Mathematics | LMATH100P | 5 | | |
| Minor in Engineering Sciences: Applied Mathematics (only available for reenrolment) | LMAP100I | 5 | | |
| Specialization track in Applied Mathematics | LMAP100P | 5 | | |
| Minor in Applied Mathematics | LFSA136I | 5 | | |
| Master [120] in Computer Science and Engineering | INFO2M | 5 | | |
| Master [120] in Electrical Engineering | ELEC2M | 5 | | |
| Master [120] in Computer Science | SINF2M | 5 | | |
| Master [120] in Chemical and Materials Engineering | KIMA2M | 5 | | |
| Bachelor in Mathematics | MATH1BA | 5 | | |
| Master [120] in Statistic: General | STAT2M | 5 | | |