GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Optimisation (C003563)

Course size *(nominal values; actual values may depend on programme)*

Credits 6.0 **Study time 165 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 1)	Dutch	Gent	lecture
			seminar

Lecturers in academic year 2024-2025

Fack, Veerle	WE02	lecturer-in-charge
Freson, Steven	WE02	co-lecturer

Offered in the following programmes in 2024-2025	**crdts**	**offering**
Bachelor of Science in Mathematics	6	A

Teaching languages

Dutch

Keywords

Optimisation in Rn, Gradient method, Newton method, Linear programming, Lagrange's theorem, Kuhn-Tucker's theorem, Combinatorial optimisation, Graphs, Greedy algorithms, Dynamic programming, Branch and Bound, Approximation algorithms

Position of the course

This course aims at stimulating the creative scientific thinking of the students, as well as developing their ability to formulate, model and solve specific optimisation problems from different scientific application areas. The course offers a broad perspective on different aspects of mathematical optimisation, including definition of the problems, techniques for solving the problems, and areas of application.

Contents

Classification of optimisation problems: univariate, multivariate, continuous, discrete, combinatorial, linear, quadratic, non-linear, with or without constraints.
Optimisation in Rn: gradient methods, Newton methods, global search algorithms.
Linear programming, simplex method and dual problems.
Optimisation in Rn with equality constraints: Lagrange's theorem.
Optimisation in Rn with inequality constraints: Kuhn-Tucker's theorem.
Greedy algorithms: optimal caching, interval scheduling, Huffman codes.
Dynamic programming: change problem, all-pairs shortest path, longest path in a directed acyclic graph, approximate string matching.
Branch-and-bound and approximation algorithms: knapsack problem, travelling salesman problem, maximum cliques, genome rearrangements.

Initial competences

Fincal compentences of the course Algorithms and Data Structures.

Final competences

The student has acquired the ability to recognise the type of optimisation problem and to choose the most appropriate technique for solving it. He/she can solve simple optimisation problems, either with analytical techniques or using suitable computer software, and he/she is able to perform an efficiency analysis of the method used.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture

Study material

Type: Syllabus

Name: Optimalisation: partim continuous optimalisation
Indicative price: Free or paid by faculty
Optional: no
Language : Dutch
Available on Ufora : Yes

Type: Syllabus

Name: Syllabus: Discrete Optimalisatie
Indicative price: Free or paid by faculty
Optional: no
Language : Dutch
Available on Ufora : Yes

Type: Slides

Name: Optimalisation: partim continuous optimalisation
Indicative price: Free or paid by faculty
Optional: yes
Language : Dutch
Available on Ufora : Yes

Type: Handouts

Name: Handouts: Discrete Optimalisatie
Indicative price: Free or paid by faculty
Optional: no
Language : Dutch
Available on Ufora : Yes

References

E. Chong and S. Zak, An Introduction to Optimization, 3rd ed. (Wiley, 2008).
W. Kocay and D.L. Kreher, "Graphs, Algorithms and Optimization", CRC Press, 2005.

Course content-related study coaching

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment

Examination methods in case of periodic assessment during the second examination period

Written assessment

Examination methods in case of permanent assessment

Oral assessment, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Calculation of the examination mark

End-of-term evaluation: 90%
Continuous assessment: 10%