GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2025-2026

Optimisation Techniques (E004120)

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

Credits 6.0 **Study time 180 h**

Course offerings and teaching methods in academic year 2025-2026

A (semester 2)	English	Gent	lecture
			seminar

Lecturers in academic year 2025-2026

Jovanov, Ljubomir	TW07	lecturer-in-charge

Offered in the following programmes in 2025-2026	crdts	offering
Bridging Programme Master of Science in Bioinformatics(main subject Engineering)	6	A
Master of Science in Electrical Engineering (main subject Communication and Information Technology)	6	A
Master of Science in Bioinformatics(main subject Engineering)	6	A
Master of Science in Computer Science Engineering	6	A

Teaching languages

English

Keywords

linear programming, optimisation, integer and binary programs, network flows

Position of the course

To familiarize the students with the most important optimization problems with discrete and continuous variables: to teach the students to formulate these problems mathematically starting from a practical problem definition, and to solve them with appropriate algorithms.

Contents

- Introduction: Overview
- Graph algorithms: spanning trees, shortest paths, dynamic programming
- Linear programs: basic principles, simplex algorithm, internal search, duality and sensitivity, multi-objective problems
- Discrete optimisation: lumpy linear programs, methods, assignment problems, routing problems
- Non-linear programs with continuous variables: principles, improving search, constrained programs, important special cases
- Network flows: flow-improving paths and cycle-cancelling, network simplex

Initial competences

Not required

Final competences

1 Understanding concepts such as relaxation, dualisation of constraints, partial solutions...
2 Being able to develop an algorithm starting from basic principles.
3 Having insight into algorithms and the conditions under which they can be applied.
4 Having insight into the possible solutions and the possible locations of optima.

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

Extra information on the teaching methods

Classroom lectures; Classroom problem solving sessions; Project

Study material

Type: Handbook

Name: Handboek
Indicative price: Free or paid by faculty
Optional: no
Language : English
Online Available : Yes
Available in the Library : Yes
Additional information: Robert J. Vanderbei: "Linear Programming Foundations and Extensions", International Series in Operations Research and Management Science, Vol. 37, 2nd edition, 2001, 472 p., Hardcover ISBN: 0-7923-7342-1., https: //www.princeton.edu/~rvdb/LPbook/ Optimization in Operations Research. Ronald L. Rardin. Prentice hall, 1998. ISBN 0-02-39815-5, via UGent library: https://lib.ugent.be/catalog/ebk01:4100000011223356

References

- Robert J. Vanderbei. Linear Programming Foundations and Extensions. International Series in Operations Research and Management Science, Vol. 37, 2nd ed., 2001, 472 p., Hardcover ISBN: 0-7923-7342-1.
- https://www.princeton.edu/~rvdb/LPbook/ https://lib.ugent.be/catalog/ebk01:4100000011223356
- R.L. Rardin. Optimization In Operations Research. Prentice Hall, 1998. ISBN: 0-02-398415-5.
- J.R. Evans and E.~Minieka. Optimization Algorithms for Networks and Graphs. Marcel Dekker, 2nd edition, 1992. ISBN 0824786025
- A. Dolan and J. Aldoes. Networks and Algorithms. An Introductory Approach. John Wiley, 1999. ISBN 0-471-93993-5.
- W.J. Cook, W.H. Cunningham, W.R. Pulleyblank, and A. Schrijver. Combinatorial Optimization. Wiley, 1998. Interscience Series in Discrete Mathematics and Optimization.
- R.G. Parker and R.L. Rardin. Discrete Optimization. Academic Press, 1988. ISBN: 0-12-545075-3.
- H.A. Taha. Operations Research. An introduction. Prentice Hall, sixth edition, 1997. ISBN: 0-13-272915-6
- W.H. Press, B.P. Flannery, S.A. Teukolsky and W.T. Vetterling. Numerical Recipes in C. Cambridge University Press. 1986
- Gill, Murray en Wright. Practical optimization. Academic Press. 1982. ISBN: 0122839528.
- N. Hartsfield and G. Ringel. Pearls in Graph Theory. A comprehensive introduction. Academic Press, 1994. ISBN: 0-12-328553-4.

Course content-related study coaching

By email or appointment

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

Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

During examination period: written open-book exam; written closed-book exam
During semester: graded project reports. Second chance: Not possible

Frequency: 1x

Calculation of the examination mark

Evaluation throughout semester as well as during examination period