

## Algorithms and Data Structures 1 (C003773)

**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 2024-2025**

A (semester 2)

Dutch

Gent

lecture

seminar

**Lecturers in academic year 2024-2025**

Fack, Veerle

WE02

lecturer-in-charge

**Offered in the following programmes in 2024-2025**

[Bachelor of Arts in Moral Sciences](#)

6

A

[Bachelor of Arts in Philosophy](#)

6

A

[Bachelor of Science in Computer Science](#)

6

A

**Teaching languages**

Dutch

**Keywords**

Algorithms, complexity analysis, algorithm design, abstract datatypes

**Position of the course**

Acquire basic skills in the domain of algorithms and data structures:

- to learn to design simple algorithms and perform a complexity analysis for those algorithms;
- to become aware of the importance of data structures for the development of efficient algorithms;
- to get acquainted with some standard techniques for algorithm design;
- to get acquainted with some standard data structures and their use in applications;
- to be able to do a basic implementation of standard data structures.

**Contents**

- Introduction to algorithms
- Complexity of algorithms
- Recursion
- Sorting algorithms
- Design strategies for algorithms (e.g. exhaustive search, divide and conquer, greedy algorithms, backtracking, branch-and-bound)
- Standard abstract data types (ADT) with applications: Stack, Queue, PriorityQueue, List, Set, SortedSet, Map, SortedMap (from Java Collections)
- Graph algorithms (such as breadth-first and depth-first search, minimal-cost spanning trees, shortest path algorithms, approximation algorithms for the traveling salesman problem)
- Implementation of standard abstract data types
  - Stack: using arrays and List
  - Queue: using arrays and List
  - List: using arrays and linked lists
  - Set/Map: using hash tables
  - SortedSet/SortedMap: using binary search trees
  - PriorityQueue: using binary heaps

**Initial competences**

Knowledge of the programming language Java and basic concepts of object-oriented programming, as taught in "Programming".

**Final competences**

- 1 The student has obtained a thorough knowledge of basic techniques in the field of algorithms and data structures: the student can design, implement and analyse algorithms for simple problems.
- 2 He/she knows how to use data structures effectively in applications and knows a basic implementation for the standard data structures.
- 3 His/her programming skills have been further improved by implementing several algorithms and by studying basic implementations of standard data structures.

**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: Algoritmen en Datastructuren 1  
Indicative price: Free or paid by faculty  
Optional: no  
Language : Dutch  
Available on Ufora : Yes

Type: Handouts

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

**References**

- Cormen T.E., Leiserson C.E., Rivest R.L. & Stein C., "Introduction to Algorithms", MIT Press, 2009 (3rd edition).
- T. Roughgarden, "Algorithms Illuminated", Soundlikeyourself Publishing, 2017.
- Sedgewick R. & Wayne K., "Algorithms", Addison-Wesley, 2011 (4th edition).

**Course content-related study coaching**

Student coaching in the classroom lectures and lab sessions on PC.  
Use of an electronic teaching environment.

**Assessment moments**

end-of-term assessment

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

Written assessment with open-ended questions

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

Written assessment with open-ended questions

**Examination methods in case of permanent assessment****Possibilities of retake in case of permanent assessment**

not applicable

**Calculation of the examination mark**