

## Module Handbook

[TUK](#) [MODHB](#) [Homepage](#)

# Course INF-02-06-K-2

Algorithms and Data Structures (4V+2U, 8.0 LP)

## Course Type

SWS	Type	Course Form	CP (Effort)	Presence-Time / Self-Study
-	K	Lecture with exercise classes (V/U)	8.0 CP	156 h
4	V	Lecture		56 h
2	U	Exercise class (in small groups)		28 h
<b>(4V+2U)</b>			<b>8.0 CP</b>	<b>84 h 156 h</b>

## Basedata

SWS	4V+2U
CP, Effort	8.0 CP = 240 h
Position of the semester	1 Sem. in SuSe
Level	[2] Bachelor (Fundamentals)
Language	[DE] German
Lecturers	Schweitzer, Pascal, Prof. Dr. (PROF   DEPT: INF)
Area of study	[INF-PFL] Mandatory Modules
Lifecycle-State	[NORM] Active

## Possible Study achievement

- Verification of study performance: **proof of successful participation in the exercise classes (ungraded)**

- Details of the examination (type, duration, criteria) will be announced at the beginning of the course.

## Contents

- Characteristics and properties of algorithms (computability, correctness, pseudocode notation)
- Runtime of algorithms (runtime and efficiency, growth of functions, asymptotic notation and calculation rules, recursive algorithms, amortized analysis)
- Runtime of operations of elementary data structures
- Sorting algorithms (primitive sorting algorithms, quicksort, mergesort, heapsort, external sorting, sorting without comparisons)
- Data structures for dictionaries (binary search trees, balanced search trees, B-trees, hashing)
- Graphs and important graph algorithms (data structures for graphs, traversing, shortest paths, minimum span trees)
- Basic Design Methods (Divide-and-Conquer, Dynamic Programming, Greedy Algorithms, Backtracking)
- Basic concepts of complexity theory (Turing machines, classes P and NP, Karp reduction, some important NP-complete problems)

## Literature

- Cormen, Leiserson, Rivest, Stein: Algorithmen - Eine Einführung. Oldenbourg Verlag, 2013.
- Mehlhorn, Kurt, and Peter Sanders. Algorithms and data structures: The basic toolbox. Springer Science & Business Media, 2008.
- Nebel: Entwurf und Analyse von Algorithmen. Springer-Verlag, 2012.
- Ottmann, Widmayer: Algorithmen und Datenstrukturen. Springer-Verlag, 2012.

## Requirements for attendance (informal)

### Courses

- [INF-02-01-K-2] Foundations of Programming (4V+4U, 10.0 LP)

## Requirements for attendance (formal)

None

## References to Course [INF-02-06-K-2]

Module	Name	Context	
[INF-02-06-M-2]	Algorithms and Data Structures	P: Obligatory	4V+2U, 8.0 LP
[INF-02-41-M-2]	Programming 2	P: Obligatory	4V+2U, 8.0 LP
[INF-82-54ITI-M-2]	Algorithms and Data Structures	P: Obligatory	4V+2U, 8.0 LP
[INF-82-54-M-2]	Algorithms and Data Structures	P: Obligatory	4V+2U, 8.0 LP
[MAT-INF-10-M-3]	Computer Science for Mathematicians	P: Obligatory	4V+2U, 8.0 LP