

## Module Handbook

TUK MODHB Homepage

# Module INF-02-06-M-2

Algorithms and Data Structures (M, 8.0 LP)

## Module Identification

Module Number	Module Name	CP (Effort)
INF-02-06-M-2	<i>Algorithms and Data Structures</i>	8.0 CP (240 h)

## Basedata

CP, Effort	8.0 CP = 240 h
Position of the semester	1 Sem. in SuSe
Level	[2] Bachelor (Fundamentals)
Language	[DE] German
Module Manager	Hinze, Ralf, Prof. Dr. (PROF   DEPT: INF)
Lecturers	Schweitzer, Pascal, Prof. Dr. (PROF   DEPT: INF)
Area of study	[INF-PFL] Mandatory Modules
Reference course of study	[INF-82.79-SG] B.Sc. Computer Science
Lifecycle-State	[NORM] Active

## Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
4V+2U	INF-02-06-K-2	P	U-Schein	PL1	8.0	SuSe

- About [INF-02-06-K-2]: Title: "Algorithms and Data Structures"; Presence-Time: 84 h; Self-Study: 156 h
- About [INF-02-06-K-2]: The study achievement "[U-Schein] proof of successful participation in the exercise classes (ungraded)" must be obtained.
  - It is a [prerequisite for the examination](#) for PL1.

## Examination achievement PL1

- Form of examination: **written exam (Klausur) (120-150 Min.)**
- Examination Frequency: each semester
- Examination number: 60206 ("Algorithms and Data Structures")

## Evaluation of grades

The grade of the module examination is also the module grade.

### Contents

From [INF-02-06-K-2] Algorithms and Data Structures:

- 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)

### Competencies / intended learning achievements

The students know basic algorithms and data structures (search methods, sorting methods, balanced search trees, hashing) and are able to,

- describe algorithms using basic data structures and algorithmic approaches,
- use standard methods for determining and describing the runtime of algorithms,
- apply common techniques for the design of algorithms to new problems,
- prove for simple problems that no efficient algorithm can exist,
- classify and compare problems according to their runtime complexity and structure.

In the exercises they have worked out a safe, precise and independent handling of the terms, statements and methods from the lecture.

### Literature

From [INF-02-06-K-2] Algorithms and Data Structures:

- 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 of the module (informal)

Modules:

- [INF-02-01-M-2] Foundations of Programming (M, 10.0 LP)

### Requirements for attendance of the module (formal)

None

## References to Module / Module Number [INF-02-06-M-2]

Course of Study	Section	Choice/Obligation
[INF-82.79-SG] B.Sc. Computer Science	[Compulsory Modules] Software Development	[P] Compulsory
[WIW-82.176-SG#2009] B.Sc. Business Administration and Engineering specialising in Computer Science (2009) [2009]	[Fundamentals] Field of study: Computer Science	[P] Compulsory
[WIW-82.?-SG#2021] B.Sc. Business Administration and Engineering specialising in Computer Science (2021) [2021]	[Specialisation] Field of Study: Computer Science	[P] Compulsory
Module-Pool	Name	
[MV-MB-INF-2022-MPOOL-6]	Wahlpflichtmodule M.Sc. Maschinenbau mit angewandter Informatik 2022	
[MV-MBINFO-MPOOL-6]	Wahlpflichtmodule Maschinenbau mit angewandter Informatik	