

# Course Manual AD

algorithms and data structures

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## – General information

**Long name** algorithms and data structures

**Approving CModule** [AD BaTIN](#)

**Responsible** Prof. Dr. Dieter Rosenthal  
Professor Fakultät IME

**Valid from** summer semester 2021

**Level** Bachelor

**Semester in the year** summer semester

**Duration** Semester

**Hours in self-study** 78

**ECTS** 5

**Professors** Prof. Dr. Dieter Rosenthal  
Professor Fakultät IME

**Requirements** basics of programming in high level programming languages

**Language** German

**Separate final exam** Yes

## Literature

Sedgewick, Robert: Algorithmen in C

Ottmann, Widmayer: Algorithmen und Datenstrukturen

Heun: Grundlegende Algorithmen

Wirth, Niklaus: Algorithmen und Datenstrukturen

Elektronische Verweise auf ebooks und Online Tutorials

## Final exam

**Details**

Students shall prove that they can 1.) explain and apply fundamental terms, concepts, and techniques, 2.) apply programming and more abstract concepts to solve application problems in the field of data structures and algorithms and 3.) assess the correctness of statements and program code. Typical types of assignments are 1.) multiple choice questions, fill-in-the-blank texts, assessment of statements, 2.) write program code or develop a solution in a more abstract form to solve given problems of limited size and 3.) finding errors in texts and program code.

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**Minimum standard**

At least 50% of the total number of points.

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**Exam Type**

EN Klausur

## – Lecture / Exercises

### Learning goals

Goal type	Description
Knowledge	concepts of object oriented programming
Knowledge	basics of linear and hierarchic data structures used in programs linear data structures (e.g. linear lists chained lists) hierarchic data structures, trees
Knowledge	analysis of the complexity of algorithms
Knowledge	Important search algorithms
Knowledge	mode of operation of important sort algorithms
Skills	apply the concepts of object oriented programming in C++
Skills	estimate the quality and useness of data structures an algorithms
Skills	implement search and sort algorithms in programs

### Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	1
Exercises (whole course)	1
Exercises (shared course)	1
Tutorial (voluntary)	0

### Special requirements

proficiency in C or Java

### Accompanying material

lecture foils and animations (electronic),  
exercises (electronic),  
example program code (electronic)

### Separate exam

No

## – Practical training

### Learning goals

Goal type	Description
Skills	develop single handed data structures and algorithms
Skills	implement linear and hierarchic data structures in C++
Skills	implement sort algorithms in C++
Skills	implement search algorithms in C++
Skills	application of the aspects listed above to real-world scenarios in small teams

### Expenditure classroom teaching

Type	Attendance (h/Wk.)
Practical training	1
Tutorial (voluntary)	0

### Special requirements

proficiency in C or Java

**Accompanying material** undefined

**Separate exam** Yes

### Separate exam

**Exam Type** EN praxisnahes Szenario bearbeiten (z.B. im Praktikum)

**Details** Students work in small teams. Each team completes multiple "rounds" with assigned appointments in the lab. In each round, programming assignments are solved. For the preparation of a laboratory appointment a "preparation sheet" has to be solved. The acquired knowledge will be tested at the beginning of the appointment (short written entrance test, interview with the supervisor). In case of failure, a follow-up appointment must be taken; in case of multiple failures, the student will be excluded from the lab. In case of success, a "laboratory work sheet" with further tasks will be worked on under supervision (and, if necessary, with assistance).

**Minimum standard**

Successful participation in all laboratory appointments, i.e. in particular independent solution (or with some assistance if necessary) of the programming assignments.