



Algorithms and Data Structures

Conditional Course

Introduction / General Info

Summer Term 2020

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About the Course

Topics

- Introduction to basic algorithms and data structures
- Sorting, searching, hashing, search trees, shortest paths, alg. analysis

No lectures

- There are recordings which you are supposed to watch

Exercises

- There will be weekly exercises which you should do
 - Exercises will be theoretical and practical
 - Not mandatory, but highly recommended

Exam: Exam at the end of the semester

- The exam will most probably be written

About the course



What is the purpose of the course?

Who is it targeted to?

- The course is for incoming M.Sc. students who do not have the necessary background required by the M.Sc. program.
 - E.g., students who did not study computer science or students from more applied schools, ...

- All necessary information about the courses will be published on the course websites:
 - Go to my group’s website: <http://ac.informatik.uni-freiburg.de>
 - Then follow teaching – summe term 2020 – Conditional Course “Algorithms and Data Structures”
- Please check the website for
 - Recordings and slides
 - Exercises and sample solutions
 - Pointers to additional literature (e.g., written lecture notes from an older version of this lecture)
 - Information about the exam
 - ...

There will be weekly exercise sheets:

- **Exercise sheets** are **published** at the latest **on Wednesday** on the website
- Exercises are **due after one week** on the **coming Wednesday** before the exercise tutorial
- If you want your exercises graded, hand in your exercises
- For the exercises, you are encouraged to build groups
- If you work in a group, the group should hand in one solution
 - Make sure that all students participate in solving & writing!
- After getting back your exercises, you can meet and discuss the exercises with your tutor on Wednesdays 16:15 – 18:00

Exercises II

For the exercises, we will use the Daphne online course system

- We will give a short introduction to the system today
- For practical exercises, we use Python as a programming language
 - Daphne allows to submit and test the programming exercises in a simple way.
 - We will demonstrate this afterwards.

Exercise Tutorials

Tutors for the course:

- Philipp Bamberger, philipp.bamberger@cs.uni-freiburg.de
- Philipp Schneider, philipp.schneider@cs.uni-freiburg.de

Weekly Tutorials:

- There is a weekly tutorial on Wednesday from 16:15 – 18:00
- In the tutorial, we discuss the upcoming exercise sheet and your solutions of the last exercise sheet
- Also ask your tutor if you have any questions!

The exercises are the most important part of the course!

- To pass the exam, it is important that you do the exercises
- If you feel comfortable with all the exercises, you should also be able to pass the exam

- When working in groups, make sure that you all participate in solving the questions and in writing the solutions!
 - You should all be able to explain your solutions to your tutor.

Purposes of the Alg. & D. S. Course

Goal: Basic understanding of how to efficiently handle and process data on a computer

- For fundamental problems that occur in essentially any larger computer program / project

Algorithms:

- How to solve complex computational problems efficiently

Data Structures:

- How to store data in an effective way so that it can be accessed efficiently



Algorithms and Algorithm Analysis:

- O-Notation
- Sorting
- Divide-and-Conquer
- Amortized Analysis
- Graph Traversal, Shortest Paths
- Dynamic Programming

Data Structures:

- Hash Tables
- Linked Lists and Binary Search Trees
- Priority Queues / Heaps
- Graph Representations