



# **Algorithms and Data Structures**

## **Conditional Course**

### **Introduction / General Info**

**Winter Term 2023/24**

# About the Course



## Topics

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

## No live 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:** 20 min oral exam at the end of the semester

# 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 our group website: <http://ac.informatik.uni-freiburg.de>
  - Then follow teaching – winter term 2023/24 – Conditional Course “Algorithms and Data Structures”
- Please check the website for
  - Recordings and slides
  - Exercises and sample solutions
  - Pointers to additional literature
  - Information about the exam
  - ...

- Zulip is a group chat / forum (<https://zulip.com>)
- We have our own Zulip server, which we will use for online discussions regarding our lectures.
  - In addition to the website, please check Zulip for announcements, etc.
  - Use Zulip to discuss questions regarding the lecture / exercises.
- There is a link on the course webpage that you can use to sign up for our Zulip server.
  - To access the link, you have to be in the university network (i.e., at the university or through VPN)

## There will be weekly exercise sheets:

- **Exercise sheets** are **published** at the latest **on Tuesday** on the website
- Exercises are **due Wednesday at 12:00** in the **following week**
- If you want your exercises graded, hand in your exercises in time
- 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 the TA on Wednesdays 12:15 – 14:00

# Exercise Tutorials

## Assistant for the course:

- Gustav Schmid, [gustav.schmid@cs.uni-freiburg.de](mailto:gustav.schmid@cs.uni-freiburg.de)

## Weekly Tutorials:

- There is a weekly tutorial on Wednesday from 12:15 – 14:00
- The tutorials are in-person (physically) in room 106-04-007
- In the tutorial, we discuss the upcoming exercise sheet and your solutions of the last exercise sheet
- Also ask the assistant if you have any other 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.



# 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

# Questions?

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