Algorithms and Data Structures

Conditional Course Introduction / General Info

Summer Term 2023

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, ...

Website

- 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 – summer term 2023 – 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

- 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)

Exercises

There will be weekly exercise sheets:

- Exercise sheets are published at the latest on Wednesday on the website
- Exercises are due Wednesday at 14:00 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 14:15 – 16:00

Exercise Tutorials

Assistants for the course:

- Mohsen Al-Zeqri, mmalzzaqri15@eng.just.edu.jo
- Marc Fuchs, marc.fuchs@cs.uni-freiburg.de

Weekly Tutorials:

- There is a weekly tutorial on Wednesday from 14:15 – 16:00
- The tutorials are in-person (physically) in room 051-00-031
- In the tutorial, we discuss the upcoming exercise sheet and your solutions of the last exercise sheet
- Also ask the assistants if you have any questions!

Exercises

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  **Data Structures**

Course Topics Algorithms & Data Struct.

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?