ALGORITHMS AND DATA STRUCTURES
UGST4032

Instructor: Márton Karsai
Credits: 2 US / 4 ECTS
Prerequisite:
• Introduction to Programming in Python (UGST4031)
• Introduction to Mathematics (UGST4032)
Term: Winter
Level: BA
Course type: mandatory
Module: Programming and Data Analysis

Brief course description: The aim of this course is to introduce mathematical modeling of computational problems, as well as common algorithms, algorithmic paradigms, and data structures used to solve these problems. It emphasizes the relationship between algorithms and programming and introduces basic performance measures and analysis techniques for these problems.

Learning outcomes: By the end of the course the student will be able to
• approach programming challenges with the basic algorithmic techniques
• design effective algorithms for various computational problem
• identify the appropriate data structure for the optimal implementation of a computational problem
• evaluate the computational performance of the implemented algorithmic solution

What you will NOT learn in this course: This course is about the data structures and algorithms. It will not provide you advanced coding and data visualization skills, neither training on data handling and database management.

Learning activities and teaching methods: Lectures and tutorials.

Assessment: A student's grade in this course will be a weighted average of his/her performance on the homework assignments and the exams. The weights are as follows: performance on the homework assignments: 30%; performance on the midterm exam: 30%; performance on the final exam: 40%. Regular class attendance is required to pass the exam. Active class participation is highly recommended.

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<th>Grade</th>
<th>Name</th>
<th>Austrian equivalent</th>
<th>Points (0-4 scale)</th>
<th>Points (0-100 scale)</th>
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<tr>
<td>A-</td>
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Attendance: Attendance is mandatory for at least 70 percent of the lectures. Absence from more than 30 percent of the classes automatically leads to failure. In case on-site teaching is allowed, online participation does not count as attendance unless officially certified.

Assignments: In the end of each Tutorial session homework will be handed out. The deadline of submission is the beginning of the next Tutorial session, a week later, on the same day. Late assignments will be evaluated but will not be recognized in the final evaluation grade.

**Course schedule:**

- **Week 1** Introduction to Algorithms and Computing
- **Week 2** Recursion
- **Week 3** Computational Complexity
- **Week 4** Program Efficiency 2, Searching
- **Week 5** Sorting
- **Week 6** Introduction to Data Structures
- **Week 7** Sets and Hashing
- **Week 8** Linear Sorting
- **Week 9** Priority queues and heaps
- **Week 10** Binary Search Trees
- **Week 11** Elementary graph algorithms
- **Week 12** Advanced graph algorithms