

MC458 - Design and Analysis of Algorithms I

Programme:

1. Review of concepts

- Computational Models
- Analysis of an algorithm
- Cost analysis (time, space, etc)
- Lower bound of a problem
- Examples: search in a sorted array, input/output

2. Mathematical Tools for Analysis of Algorithms

- Function Growing and Asymptotic Notation
- Recurrence relations: asymptotic and exact solutions

3. Design of algorithms by induction

- Mathematical Induction and Design of algorithms by induction
- Design by Simple and by Strong Induction
- Design by Divide-and-Conquer

4. Search, sorting and order statistics

- Binary Search. Optional: Variations of Binary Search
- Divide-and-conquer paradigm (mergesort, binary search, median)
- Conquer may precede division (quicksort)
- Average case analysis of quicksort
- Computing the median and the k-th order statistics through quicksort partition
- Linear worst-case algorithm for selecting the median and the k-th order statistics
- Advantages of choosing a suitable data structure for the design of efficient algorithms
- Lower bound for search in a sorted array, sorting, and median selection
- Linear algorithms for sorting

5. Dynamic Programming

- Description of the method
- Applications of the method. Suggested examples:
 - Matrix chain multiplication
 - Longest Common Subsequence

6. Greedy Algorithms

- Description of the method
- Applications of the method. Suggested de examples:
 - Activity-selection problem

