Introduction to Algorithms

Topic 0 : Course Information

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School of Computer Science and Technology
University of Science and Technology of China (USTC)

Fall Semester 2023

Course Information

- **Lecture Time and Room**
  - Tuesday 2:00PM-3:35PM, Thursday 2:00PM-3:35PM
  - GT-B212
- **Credit Hours**: 60 (Theory) + 30 (Experiment), 3.5 points

Course Information

- **Lecture Time and Room**
  - Tuesday 2:00PM-3:35PM, Thursday 2:00PM-3:35PM
  - GT-B212
- **Credit Hours**: 60 (Theory) + 30 (Experiment), 3.5 points
- **Text Book and Recommended References**
  - Textbook: 《Introduction to Algorithms》, Thomas. H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Glifford Stein.
    中文翻译版：《算法导论》，机械工业出版社. Thomas. H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Glifford Stein 著. 潘金贵，顾铁成，李成法，叶懋 译
  - Main Reference：《Algorithm Design》影印版（中文名：算法设计），清华大学出版社. Jon Kleinberg, Eva Tardos 著

Course Objectives

- **Fundamental course for every subject in CS.**
  - Introduction to the design, behavior, and analysis of computer algorithms.
  - Searching, sorting, and combinatorial algorithms are emphasized.
  - Worst case and average bounds on time and space usage.
  - Besides, practicing efficient implementation of algorithms.
- **Prerequisite courses**
  - 程序设计，数据结构，高等数学，离散数学

Course Outline

- Basic Concepts
- Asymptotic Mark and Recursive Equation
- Comparison Based Sorting Algorithms
  - insertion sort, shellsort, quicksort, etc.
- Sorting in Linear Time
  - counting sort, radix sort, bucket sort and order statistics
- Advanced Data Structure
  - binary search trees, red-black trees, and etc.
- Basic Algorithm Design Strategies
  - dynamic programming, greedy methods, divide-and-conquer
- Graph Algorithms
  - DFS, BFS, minimum spanning tree, shortest path
- String Matching Algorithms
  - brute-force, KMP, SHIFT-OR, BM, BMH, QS, KR
- NP Completeness and Approximation Algorithm

Course Load

- Assignments and Experiments (25%)
  - Assignments: 10 homeworks, assigned almost every week with firm deadlines
  - 6 Experiments:

    排序算法及性能对比

    Tentative Date: 2023.10.11

    高级数据结构：红黑树、数据结构扩张、二项堆

    Tentative Date: 2023.11.06

    动态规划法：LCS、矩阵链乘、最优二分检索树

    Tentative Date: 2023.11.20

    贪心算法：区间覆盖、K 进制编码、活动按排、背包问题

    Tentative Date: 2023.11.29

    图论算法：所有点对最短路径、强连通分量

    Tentative Date: 2023.12.20

    串匹配算法：KMP、BM、KR、Quick Search

    Tentative Date: 2023.12.31

Course Load

- Assignments and Experiments (25%)
- Mideterm (20%) (Tentative Date: 2023.10.20)
- Final Examination (40%) (in the examination week)
- Class Attendance and Activity (15%)
  - Attendance and in-class quiz (10%).
  - Active students (e.g., interacting with instructors) will win the other 5 points.

Grading Policy

- The instructor reserves the right to make adjustments to these weights based on his a posteriori evaluation of the relative difficulty of the exams and homework.
- Each problem will be graded 80% for correctness and 20% for style and clarity.
- **Final Grade** $W = \frac{W_1 + W_2}{2}$, W_1 is the final weighted score (Assginments and Experiments + Attendance + Midterm + Final) and $W_2 = 100 \times \frac{W_1}{AverageTopFive}$. Here AverageTopFive is the average of W_1 of the best five students in the class. For example, if your $W_1 = 70$, and $AverageTopFive = 90$, then your $W = \frac{70 + 70 * 100/90}{2} \simeq 73.89$.
- **No plagiarism will be tolerated**

TAs

- 于颖奇, yu971207@mail.ustc.edu.cn
- 吴迪, diwu@mail.ustc.edu.cn
- 章馨月, xinyuezhang@mail.ustc.edu.cn
- 陈泓霖, chl777@mail.ustc.edu.cn
- 胡毅翔, yixianghu@mail.ustc.edu.cn
- Weekly Recitation: 15:35 – 16:35 on every Tuesday (Tentative, to be discussed with students)
- Weekly Office Hours: every TA has some office hours (to be discussed with TAs), students can stop by during office hours.

彩蛋：企业实践访学

- 活动目的：为同学们提供与企业交流的平台，了解算法在企业的实际需求，理实交融；鼓励学生基于实际应用总结问题，并通过课题、大创等科研形式，在学校老师和企业工程师的帮助下，提出并解决科研问题；
- 具体安排：期中考试后，基于自愿报名，挑选全班约 10% 的同学，参访知名企业及其算法实验室（如 MSRA, 华为、阿里、腾讯、讯飞等）；
- 中国科大教学研究类重点项目“算法实践与算法教学质量提升”支持。

Course Links

- Course Homepage: **https://cloud.linkeedge.top:1443**
  All handouts and announcements will be posted there.
  - course information
  - course schedule and slides
  - assignments, exams and answers.
- Online Judge: **https://cloud.linkeedge.top:14432**
  - Your programs submitted and tested here.
- bb platform **https://www.bb.ustc.edu.cn/**
  - Upload your assignments here
  - Writing assignments with Latex (highly recommended), MS Word, or just taking a photo of your answers on a paper.

Wish You Enjoy This Course!