NTUST, CSIE
Algorithms (CS3001-301, 必修), Spring 2022
Syllabus

Instructor: 臺科大資工系 鮑興國 Ph.D.
T4-505
Office Tel.: 2730-1065
pao@mail.ntust.edu.tw

Time & Place: Tue. 9:10 – 10:00, Wed. 10:20 – 12:10 (TR – 214)

Website: http://moodle.ntust.edu.tw/

Prerequisite: Data structures, some experience in high-level programming languages (e.g., C/C++, Java).

Textbook & Reference books:

Introduction to Algorithms (3rd Edition) by T.H.Cormen, C.E.Leiserson, R.L.Rivest, C.Stein, MIT Press (2009) (開發)

Grading:

Midterm	30%
Final	30%
Homework	40%

- 總共大約四至五個作業，其中可能含有一至兩個程式語言撰寫作業。
- 書面作業於上課前繳交，程式語言作業於期限當日午夜 12 時前繳交，遲交依遲交時間等比例扣分。
- **任何作業不允許抄襲，引用任何資料請註明出處。**

Outline

(*__bold__ means a must)

I. *Introduction (chapter 1, 3, 4)*
   A. **Complexity and Growth of Functions**: asymptotic notation, common functions
   B. **Divide and Conquer**
   C. **Recurrences**: recurrence equations, master theorem
II. *Data Structures (chapter 11, 12, 13, 18, 20, 21)*
   A. Trees: binary search trees, red-black trees, B-trees, van Emde Boas trees
   B. **Hashing**: direct-address tables, chaining, open addressing
   C. **Heaps**: priority queues
   D. **Sets**: data structures for disjoint sets
III. *Basic and Advanced Algorithms (chapter 2, 6, 7, 8)*
   A. Basic Sorting Methods: insertion sort, merge sort, selection sort, bubble sort
   B. **Advanced Sorting Methods**: heapsort, quicksort, counting sort, radix sort
IV. *Advanced Design and Analysis Techniques (chapter 15, 16)*
   A. **Greedy Algorithms**: Huffman codes
   B. **Dynamic Programming**: matrix-chain multiplication, longest common subsequence
V. *Graph Algorithms (chapter 22 – 26)*
   A. **Elementary Graph Algorithms**: breadth-first search, depth-first search, topological sort, strongly connected components
   B. **Minimum Spanning Tree**: Prim's and Kruskal's algorithms
   C. **Single-Source Shortest Paths**: Bellman-Ford algorithm, Dijkstra's algorithm
   D. All-pairs Shortest Paths: Floyd-Warshall algorithm
   E. Maximum Flow