CS4311
Design and Analysis of Algorithms

General Info, Scope, Textbook, Assessment, ...
General Information

• Web page:  
  www.cs.nthu.edu.tw/~wkhon/algo09.html

• Lecturer: Wing-Kai Hon (韓永楷)

• TAs: Wisely (古宗翰) Frank (邱聖元)  
  Foga (劉富翃) Jenny (劉向瑄)

• Meeting Times
  - Tue: 10:10—12:00  Thur: 11:10—12:00
  - Extra tutorial hours (to be announced)
This course is about Algorithm. So, what is an algorithm?

• We face many problems every day
  - Transform an input into a desired output

• Example: Given a list of 10 numbers, sorted in increasing order. Determine if the number “5” is in the list
  - what is the input? what is the output?

• Algorithm: A method of solving a problem, using a sequence of well-defined steps
Algorithms for our Example

- **Algorithm 1**: (Linear Scan)
  - Look at every number in the list

- **Algorithm 2**: (Binary Search)
  - If the list has 1 element, answer directly
  - Else, compare the middle number $M$ in the list
    - **Case 1**: If equals, answer “YES”
    - **Case 2**: If $M$ is bigger, search left half
    - **Case 3**: If $M$ is smaller, search right half
Algorithms for our Example

• Both algorithms can be extended to solve a more general problem, for any sorted list of any length, and for any target number.

• Question: When the length of the list is VERY long, say, 100000, which algorithm will you prefer? Why?
What will we study?

• Look at some classical algorithms on different kinds of problems
• How to design an algorithm
• How to show that an algorithm works correctly
• How to analyze the performance of an algorithm
Teaching Plan

- Part I: Basics
  - Growth of Function, Solving Recurrence
    ➔ important in the analysis part
- Part II: Sorting & Median
- Part III: Basic Data Structures
  - Hash Table, Red-Black Tree, ...
  ➔ Self study
Teaching Plan

• Part IV: More Design & Analysis
• Part V: More Data Structures
• Part VI: Graph Algorithms
  - Minimum Spanning Tree
  - Shortest Path, Maximum Flow
• Part VII: Selected Topics
  (if we have time)
Textbook & References

• Textbook:
  - Introduction to Algorithms, by Cormen et al.
  - Prof. Wang’s notes (see our webpage)

• References
  - Introduction to Design and Analysis of Algorithms, by Lee et al.
  - Algorithms in C++, by Sedgewick
  - The Art of Computer Programming, by Knuth
Assessments

7-8 Assignments (equal weights):
    subtotal = 25%

2 Quizzes:
    subtotal = 50%

1 Final Exam:
    subtotal = 25%

--------------------------------------------
Total 100%
Study Tips

• Have a fresh mind in lectures & tutorials
  - sleep well, don’t over-eat before coming :-) 

• Don’t be shy, ask questions 

• Try your best to do every assignment
  - can work in groups and exchange high-level ideas, but must do it separately in the end 

• Study textbook, and try the exercises

• Most importantly: Have fun!