ALGORITHMS

李昆忠
國立成功大學電機系

06-2757575 X 62371
kjlee@mail.ncku.edu.tw
Algorithm

• Any well-defined computational procedure that takes some value(s) as input and produces some value(s) as output.

• A sequence of computational steps that transform the input into the output.

• A tool for solving a well-specified computational problem.

Input → Algorithms
(English, Computer program, Hardware) → Output
Why Study Algorithms?

- Comparison with two algorithms implemented on two computers

- A fast computer with an inferior algorithm may perform worse than a slow computer with a superior algorithm
Applications of Algorithms

- **IC design:** timing optimization, design space exploration, power estimation, placement & routing, testing, diagnosis, …
- **Multimedia:** Audio/Video data compression, error correction, …
- **Internet:** data management, search and delivery, …
- **E-commerce:** Security, inventory, freight transport
- **Game:** AI, Chess, real-time game, …
- **DSP:** Fourier transform, DWT, DCT, medical signal processing, …
- **Human Gene Sequencing Project**
Objective and Pre-requisites

- **Course objective:** to provide theoretical foundations and technical knowledge of efficient algorithms for computational problems

- **What to learn:**
  - How to design and write efficient programs
  - Using fundamental data structures and algorithms to solve real world problems
  - Ability to analyze algorithms for time and space efficiency

- **Prerequisites:** basic programming skills, with some data structures background
1. Introduction: Basic of algorithms
2. Mathematical Background: Growth of functions, recurrences, discrete mathematics, master theorem, probability analysis
3. Sorting: Heapsort, Quicksort, Bucket Sort, etc.
4. Data structures
5. Design & analysis techniques: dynamic programming, greedy algorithms, amortized analysis, etc.
6. Advanced data structures
7. Graph algorithms
8. NP-completeness
9. Selected topics
Textbooks

Some Class Information

• Homeworks & Exercises: 20-30%
• One Midterm Exam: 25-35%
• One Final Exam: 30-40%
• Programming: 20-30%
• Teaching Assistant: (To be announced)
  – (62400 X 2827, EE95502)
  – {?}@beethoven.ee.ncku.edu.tw

• WWW 網站:
  http://beethoven.ee.ncku.edu.tw/testab/course/algorithms_course/index.htm