What The Course Is About

Data structures is concerned with the representation and manipulation of data.
All programs manipulate data.
So, all programs represent data in some way.
Data manipulation requires an algorithm.

What The Course Is About

Algorithm design methods needed to develop programs that do the data manipulation.
The study of data structures and algorithms is fundamental to Computer Science.

Prerequisites

Java
Asymptotic Complexity
• Big Oh, Theta, and Omega notations

Web Site

www.cise.ufl.edu/~sahni/cop3530
Handouts, syllabus, text, source codes, exercise solutions, lectures, assignments, past exams, past exam solutions, TAs, etc.
My office data.
Assignments

- Assignment guidelines
- Submission procedures
- Do Assignment 0 by next week.

Source Codes

- Read download and use instructions.
- Must have Java 1.2 or higher.
- See ProgramIndex.htm, AllNames.html and other html files produced by Javadoc for Java codes.

Discussion Sections

- Go to any one
- TA will answer your questions
- TA will go through a few exercises from the book
- Web site lists what is done in each meeting of the discussion section

Organization of Text

- Three parts
- Part I … Chapters 1-4, Background
- Part 2 … Chapters 5-17, Data Structures
- Part 3 … Chapters 18-22, Algorithms
- Each chapter … concepts + applications

Grades

- 25% for assignments
- 25% for each test

Grades (Rough Cutoffs)

- A  >= 83%
- B+  >= 75%
- B    >= 70%
- C+  >= 65%
- C    >= 60%
- D+  >= 55%
- D    >= 50%
**Sorting**

- Rearrange $a[0], a[1], ..., a[n-1]$ into ascending order. When done, $a[0] \leq a[1] \leq ... \leq a[n-1]$
- $8, 6, 9, 4, 3 \Rightarrow 3, 4, 6, 8, 9$

**Sort Methods**

- Insertion Sort
- Bubble Sort
- Selection Sort
- Count Sort
- Shaker Sort
- Shell Sort
- Heap Sort
- Merge Sort
- Quick Sort

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**Insert An Element**

- Given a sorted list/sequence, insert a new element
- Given $3, 6, 9, 14$
- Insert 5
- Result $3, 5, 6, 9, 14$

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**Insert an Element**

- $3, 6, 9, 14$ insert 5
- Compare new element (5) and last one (14)
- Shift 14 right to get $3, 6, 9, , 14$
- Shift 9 right to get $3, 6, , 9, 14$
- Shift 6 right to get $3, , 6, 9, 14$
- Insert 5 to get $3, 5, 6, 9, 14$

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**Insert An Element**

```c
// insert t into a[0:i-1]
int j;
for (j = i - 1; j >= 0 && t < a[j]; j--)
    a[j + 1] = a[j];
a[j + 1] = t;
```

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**Insertion Sort**

- Start with a sequence of size 1
- Repeatedly insert remaining elements
Insertion Sort

- Sort 7, 3, 5, 6, 1
- Start with 7 and insert 3 => 3, 7
- Insert 5 => 3, 5, 7
- Insert 6 => 3, 5, 6, 7
- Insert 1 => 1, 3, 5, 6, 7

Insertion Sort

```java
for (int i = 1; i < a.length; i++)
    // insert a[i] into a[0:i-1]
    // code to insert comes here
```