

## 1 Schedule

Problem sessions:

Part 1 of the homework is **due Nov 3**.  
Part 2 of the homework is **due Nov 5**.  
The **QUIZ** will be on **Tuesday, Nov. 10, 2008**.

## 2 List of algorithms covered in the class

(B-basic, I-intermediate, A-advanced):

- B: Huffman encoding (p.139, DSV).
- I: Coin-change problems (handout).
- I: Longest increasing subsequence (p.157, DSV).
- I: Edit distance (p.159, DSV).
- I: Knapsack (p.164, DSV).
- A: Chain matrix multiplication (p.171, DSV).
- A: Independent sets in trees (p.176, DSV).

## 3 Basic material

**Important concepts, problems, theorems, and algorithms:**

- Two basic greedy algorithms: Huffman encoding, coin change.
- Two basic dynamic programming algorithms: knapsack, longest increasing subsequence.

**Testing method:**

- Trace all of the four algorithms above/compute answer to example problems.

**Example test problems (homework):**

**4.1 (due Nov 3)** Suppose that symbols  $a, b, c, d, e, f, g, h$  occur with frequencies  $1/36, 1/36, 1/12, 1/9, 5/36, 1/6, 7/36, 1/4$ , respectively. Construct the Huffman encoding of the alphabet.

**4.2 (due Nov 3)** Consider the coin change problem with coin values 1, 3, 5. Does the greedy algorithm always find an optimal solution? If the answer is no, provide a counterexample. If the answer is yes, give a proof.

**4.3 (due Nov 3)** Consider the coin change problem with coin values 1, 4, 6. Does the greedy algorithm always find an optimal solution? If the answer is no, provide a counterexample. If the answer is yes, give a proof.

**4.4 (due Nov 3)** Consider the coin change problem with coin values 1, 4, 7. Does the greedy algorithm always find an optimal solution? If the answer is no, provide a counterexample. If the answer is yes, give a proof.

**4.5 (due Nov 3)** Consider the knapsack problem with knapsack limit 136 and the following items (weight,value):

$(41, 4), (48, 4), (44, 4), (37, 3), (29, 2), (26, 2), (22, 2), (40, 4), (46, 4)$ .

Find an optimal solution of the problem.

**4.6 (due Nov 3)** Find the longest increasing subsequence of

$5, 3, 4, 1, 6, 10, 7, 11, 12, 8, 9$ .

