Due date: April 28, 2009
Do at least four of the following problems.

1. Exercise 6.5 (from Chapter 6, posted on the web).

2. Exercise 6.8 (from Chapter 6, posted on the web).

3. (*) Give a 2-approximation algorithm for $1|\sum U_j|C_{\text{max}}$. (That is, design such an algorithm and prove that it has the stated performance guarantee.)

4. Consider the following generalization of $P|\text{pmtn}|C_{\text{max}}$. Each machine $i$ has a memory capacity $c_i$, $i = 1, \ldots, m$. Each job $j$, in addition to its processing requirement, has a memory requirement $R_j$, $j = 1, \ldots, n$. Job $j$ can be processed on machine $i$ only if $R_j \leq c_i$.
   
   (a) Give a 2-line proof that this problem can be solved in polynomial time.
   
   (b) Give an algorithm that finds an optimal solution that can be implemented to run in $O((n+m) \log(n+m))$ time, and finds a schedule with at most $m-1$ preemptions.

5. Exercise 9.11 (from Chapter 9, posted on the web).

6. (*) For $R||C_{\text{max}}$, prove that the ratio between the optimal non-preemptive schedule length, and the optimal preemptive schedule length is at most 4.

7. (Research problem) Prove (or disprove) that, for $R||C_{\text{max}}$, there always exists a non-preemptive schedule of length within a factor of two of the optimal preemptive schedule.