Course Description

Scheduling is a key concept in all manufacturing and service industries. The course does primarily focus on machine scheduling problems and evolves in two ways. Starting with the preliminaries and fundamental concepts in machine scheduling, we will first discuss the basic building blocks of all: the single-machine scheduling problems. Subsequently, we will apply our insights based on these relatively simple models to more complex scheduling environments, such as parallel machine and job shop scheduling problems. The second aspect of this course is related to a set of selected general concepts and methodologies applied commonly in combinatorial optimization. Most notably, scheduling problems will motivate us to introduce dynamic programming, complexity theory, and approximation algorithms at a basic level.

Course Outline

This is a tentative outline. Additions/subtractions may occur as the semester progresses.

1. Introduction.
2. Machine Scheduling Models
   a. Preliminaries of scheduling theory
   b. Single machine models
   c. Parallel machine models
   d. Job shop models
   e. Flow shop models. (Time permitting.)
3. Concepts and Solution Methodologies
   a. Dynamic Programming
b. Complexity Theory

c. Approximation Algorithms.

Grading

1. Homeworks. Solutions will be provided, but homeworks will not be graded formally. Note that you still have to turn in your homeworks.

2. Three pop-up quizzes (10%). The worst grade will be dropped. The quizzes will be closely related to the homework questions.

3. Midterm (30%).

4. Final (40%).

5. Project (20%).

Software

Information and support for all academic software provided by the university can be found at:

http://mysu.sabanciuni.edu/bt/servisler/tr/?yazilim/lisansli/yazilimlar.html

1. Some homework problems and your term project may require formulating an integer or linear programming model and actually solving it with mathematical programming software. You are free to use any software that you like (GAMS, AMPL, LINGO, IBM ILOG CPLEX Optimization Studio - aka OPL Studio formerly - etc.), but I will only use CPLEX Optimization Studio in my solutions. It is your responsibility to learn how to use these software.

A trial version of LINDO/LINGO is available from the web site of the vendor (see below), and full versions of GAMS, AMPL, and CPLEX Optimization Studio can be downloaded from the software server of the university:

http://software.sabanciuni.edu/academic/GAMS/
http://software.sabanciuni.edu/academic/ILOG/

A detailed set of instructions for installing AMPL and the IBM ILOG products is provided on SUCourse along with a tutorial on AMPL. Documentation for IBM ILOG products is installed automatically.

Furthermore, recent versions of MATLAB have an interface to the CPLEX optimization engine of IBM ILOG. I strongly urge you to familiarize yourself with this library in MATLAB. It is a great tool for prototyping and decreases the development time significantly compared to a C/C++ implementation. The installation instructions mentioned above detail the steps required to install the CPLEX interface in MATLAB.

For more information on these software products:
http://www-01.ibm.com/software/websphere/ilog/
www.ampl.com
www.gams.com
www.lindo.com

2. The LEKIN - Flexible Job-Shop Scheduling System that comes with your textbook is capable of solving many of the machine scheduling problems that we will consider. The setup file is under SUCourse.

3. Some homework problems and your term project may involve coding an algorithm in a general purpose programming language, e.g., Visual Basic, C, C++, Java, etc.
Textbook


References


Planning and scheduling in manufacturing and services. Michael Pinedo. Springer, 2005. (On reserve at the Information Center.)

