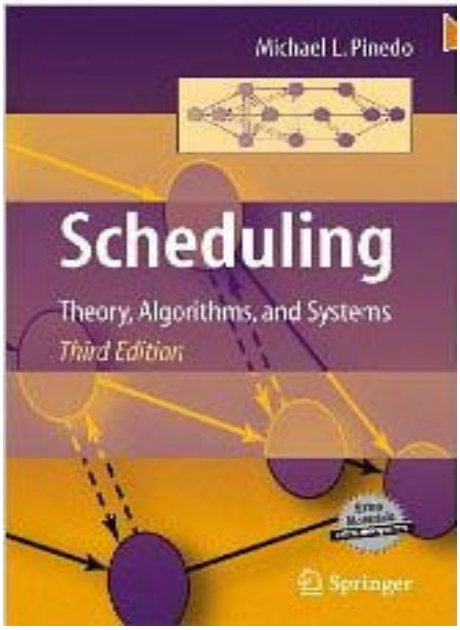

Scheduling

Theory, Algorithms, and Systems

4th Edition

Michael Pinedo

Springer

Materials Provided by:

Julius Atlason (University of Michigan)
Stefan Bock (University of Wuppertal)
Heidemarie Braesel (University of Magdeburg)
Johann Hurink (Technical University of Twente)
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Rakesh Nagi (SUNY Buffalo)
Tim Nieberg (University of Bonn)
Uwe Schwiegelshohn (University of Dortmund)
Natalia Shakhlevich (University of Leeds)
Sridhar Tayur (Carnegie Mellon University)

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1. **Slides from Academia**

   a. Julius Atlason (University of Michigan)
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p. Major Printing Supplies Company

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a. Natalia Shakhlevich (University of Leeds)

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a. SAIGA
b. United Airlines
c. Preactor (Parts I&II)

1. Slides from Academia

The textbook, *Scheduling: Theory, Algorithms, and Systems*, has been adopted by more than 20 instructors worldwide. A number of these instructors have developed elaborate websites and large number of power point transparencies and PDF slides. In this CD we have compiled the material developed by five of them, namely

a. Julius Atlason (University of Michigan) …… 252 PPT slides

b. Stefan Bock (University of Wuppertal) …….. 376 PDF slides

c. Johann Hurink (Technical University of Twente) …….. 339 PDF slides

d. Rakesh Nagi (SUNY at Buffalo) ……..…… 175 PDF slides
…… 43 PPT slides

e. Tim Nieberg (University of Bonn) ……. 130 PDF slides

f. Uwe Schwiegelshohn (University of Dortmund) ...…… 344 PDF slides
…… 154 PPT slides

g. Natalia Shakhlevich (University of Leeds) …… 70 PPT slides

a. University of Michigan

Professor Julius Atlason

Course Title: Scheduling
Course Description: The problem of scheduling several tasks over time, including the topics of measures of performance, single-machine sequencing, flow shop scheduling, the job shop problem, and priority dispatching. Integer programming, dynamic programming, and heuristic approaches to various problems are presented.

b. University of Wuppertal

Professor Stefan Bock

Course Title: Scheduling – Basic Models and Algorithms
Course Description: Scheduling and Operations Management. Basic Definitions in Scheduling. Simple Single Stage Systems. Single Stage Sequencing Problems with Heads and Tails. Job Shop Scheduling. Flow Shop Scheduling. Real-Time Control of Job Shop Systems.

c. University of Twente

Professor Johann Hurink

Course Title: Scheduling
Course Description: The term scheduling represents the assignment of resources over time to perform some tasks, jobs or activities. Feasible schedules are compared with respect to a given optimality criterion. Mostly, the optimization problem is combinatorial and very complex. From a computational point of view these problems are hard (NP-hard) and the classical techniques fail in practice. Therefore, the optimal solution is often approximated by heuristics.

The following subjects are discussed:

- ✓ CPM and PERT
- ✓ Single-Machine Models (Exact and Approximation Methods)
- ✓ Parallel Machines
- ✓ On-Line Models
- ✓ Open Shop, Flow Shop and Job Shop Models
- ✓ Timetabling

d. SUNY at Buffalo

Professor Rakesh Nagi

Course Title: Scheduling Theory
Course Description: The objective of this graduate level course is to expose participants to basic scheduling theory results, and in a participatory setting, enable them to discuss and creatively synthesize these ideas to research projects of choice. It blends quantitative and qualitative material, from multiple disciplines of industrial and management engineering. The course will be conducted in a beneficial cooperative learning setting. Lectures, group discussions, research projects and participant presentations will constitute this course. The following topics will be covered.

Course Topics:

Introduction

Part 1: Deterministic Models
- ✓ Framework, Notation and Complexity Hierarchy
- ✓ Single Machine Models
- ✓ Advanced Single Machine Models
- ✓ Parallel Machine Models
- ✓ Flow Shop and Flexible Flow Shops
- ✓ Job Shops
- ✓ Open shops

Part 2: Stochastic Models
- ✓ Introduction and Basic Results

Part 3: Project and Network Scheduling
- ✓ JIT Scheduling of Assemblies
- ✓ Integrated Lot-Sizing
- ✓ Integrated Material Handling

Part 4: Scheduling in Practice
- ✓ Dispatching Rules
- ✓ Filtered Beam Search
- ✓ Local Search: SA, Tabu Search, GA

Several Research Articles and Case Studies

e. University of Dortmund

Professor Uwe Schwiegelshohn

f. University of Bonn

Professor Tim Nieberg

Course Title: Scheduling

Course Description: The term scheduling represents the assignment of resources over time to perform some tasks, jobs or activities. Feasible schedules are compared with respect to a given optimality criterion. Mostly, the optimization problem is combinatorial and very complex. From a computational point of view these problems are hard (NP-hard) and the classical techniques fail in practice. Therefore, an optimal solution is often approximated. The following topics will be discussed:

- Classification of scheduling models
- Single-machine models
- Parallel-machine models
- Open shop, flow shop and job shop models
- Timetabling
- Transportation
- On-line models

g. University of Leeds

Professor Natalia Shakhlevich

Course Title: Scheduling: Models and Algorithms

Course Description: Scheduling applications and terminology. Exact and approximation algorithms for single-stage processing systems (single machine, parallel machines) and multi-stage systems (flow shop, open shop, job shop). General scheduling techniques: dispatching rules, branch and bound algorithm, beam search, shifted bottleneck procedure. Local search methods: iterative improvement, threshold acceptance, simulated annealing, tabu search, genetic algorithms. Computational complexity, algorithm analysis.

2. Scheduling Systems

a. LEKIN

This CD contains a copy of the LEKIN scheduling system, which is being used at hundreds of universities and companies worldwide.

b. LiSA

This program is provided by Heidemarie Braesel, University of Magdeburg.

c. TORSCHE

Provided by Michal Kutil, Czech Technical University, Prague.

3. Case

"Managing Operations in the Time-Shared Jet Business".
(Pinar Keskinocak, Georgia Institute of Technology, and
Sridhar Tayur, Carnegie Mellon University)

4. Mini Cases:

Asprova

a. Kihara Manufacturing Company
b. Mitsubishi Electric Corporation (Nakatsugawa Works)
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e. Mitusbishi Heavy Industries, Ltd.

Preactor

f. Plastform
g. Teikon

SAP

h. Grammer
i. Mittal Steel Company
j. mySAP Supply Chain Management

Taylor Software

k. BCM Kosmetik Gmbh
l. Beaver Plastics
m. Fountain Set (Holdings) Limited
n. Lexmark
o. Major Pharmaceuticals Manufacturer
p. Major Printing Supplies Company

5. Handouts

This section includes papers that are useful additional reading. The papers are selected based on the insights and perspectives they provide.

Natalia Shakhlevich (University of Leeds) …… 12 Handouts

6. Movies

Double-click on the movie. The movie should automatically open in either Windows Media Player, or Winamp. If you cannot view the movie, go to the Microsoft website (http://www.microsoft.com) and download Windows Media Player.

a. Saïga

Aéroports de Paris (A 14 minute film)

Presenting Saïga, an application developed with ILOG products by Aéroports de Paris. Designed to optimize resource allocation at airports, Saïga includes a graphical user interface, a planning and allocation optimization module, and a real-time control engine. ILOG products are used at many other airports throughout the world as well. At London's Heathrow Airport, for example, British Airways is using an ILOG-based application to design the proposed Terminal 5.

Airports are not the only operations that use ILOG products; they are also widely used in the telecommunications, defense, transportation and manufacturing industries. Also featured in the film is an ILOG-based system used by Motorola to schedule the satellites in IRIDIUM, a global communication system.

b. United Airlines

PEGASUS Software (A 10 minute film)

Managing flight schedules tends to be a very complicated process and involves many different variables, like aircraft scheduling, maintenance, crew scheduling and so on. Moreover, it has to be flexible enough to meet the changing expectations of the customers. PEGASUS, the scheduling system developed by United Airlines, uses a heuristic system, instead of a linear program, to develop flight schedules that are both efficient and flexible.

c. Preactor International

Preactor International is a world leader in Production Planning and Scheduling software used by a wide range of businesses. So successful has Preactor's breakthrough technology been that the number of companies using the product recently reached the 3,500 mark. These companies are a mix of small and medium sized as well as large corporations located in 67 countries. Preactor is used by companies in discrete, process and mixed mode type of environments. It is equally at home in modelling plants that involve machines, packing lines, tanks, assembly lines and so on in make to order, make to stock, engineer to order, repetitive and continuous processes.