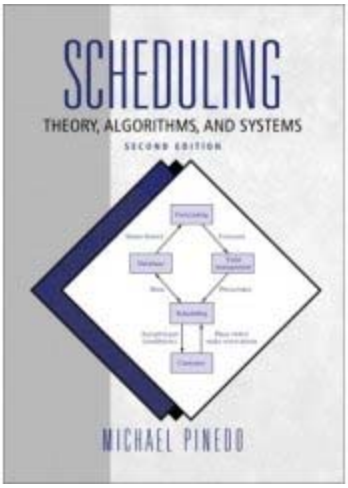
Scheduling : Theory, Algorithms, and Systems / M. Pinedo.



Scheduling: Theory, Algorithms, and System

3rd Edition

(Springer)

by:

Michael Pinedo

Materials Provided by:

Julius Atlason (University of Michigan)
Heidemarie Braesel (Universität Magdeburg)
Johann Hurink (University of Twente, The Netherlands)
Pinar Keskinocak (Georgia Institute of Technology)
Rakesh Nagi (University at Buffalo)
Uwe Schwiegelshohn (CEI University Dortmund)
Natalia Shakhlevich (University of Leeds)
Sridhar Tayur (Carnegie Mellon University)

Contents of the CD:

1. Slides from Academia

a. Julius Atlason (University of Michigan)
b. Johann Hurink (University of Twente, The Netherlands)
c. Rakesh Nagi (University at Buffalo)
d. Uwe Schwiegelshohn (CEI University Dortmund)
e. Natalia Shakhlevich (University of Leeds)

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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 transparencies

b. Johann Hurink (University of Twente, The Netherlands) …… 339 PDF slides

c. Rakesh Nagi (University at Buffalo) …… 175 PDF slides
…… 43 transparencies

d. Uwe Schwiegelshohn (CEI University Dortmund) …… 344 PDF slides
…… 154 transparencies

e. Natalia Shakhlevich (University of Leeds) …… 70 transparencies

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 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

c. University 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

d. CEI University Dortmund

Professor Uwe Schwiegelshohn

e. University of Leeds

Professor Natalia Shakhlevich

Course Title: Scheduling: Models and Algorithms

Course Description: On completion of this module, students should: understand the general concepts of scheduling theory, have an appreciation of a variety of techniques and approaches, be able to apply basic scheduling algorithms to solve a wide range of problems, have some experience of using scheduling software, understand the importance of algorithm analysis.

Syllabus: 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, Universität Magdeburg.

c. TORSCHE

Provided by Michal Kutil, Czech Technical University, Prague.

3. Cases

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

4. Mini Cases:

Taylor Software

a. BCM Kosmetik Gmbh
b. Beaver Plastics
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d. Lexmark
e. Major Pharmaceuticals Manufacturer
f. Major Printing Supplies Company

SAP

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

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.