also consists of five papers, some of which are more abstract and less pragmatic than the earlier papers in the book. A group of seven authors discuss how to assess the effectiveness of a manufacturing information system, Fransoo and Raaymakers describe the use of linear regression to aid planning and scheduling in the batch chemical industry. Batchelor studies the paradoxes and paradigm shifts involved as Rover moved from the heavy influence by Honda to the ownership by BMW and how this impacted the engineering of the Rover 75 for 'world class logistics'. Stomp and Ruël outline the use of a socio-technical systems approach to design a production control system and conclude that, rather than the control structure following from the production structure, it would be better to design both production system and control system simultaneously. In the last paper in this part, Wäfler also uses a socio-technical systems approach to consider how to plan and schedule the scheduler's activities in planning and scheduling a plant. This is an issue that I have not seen addressed before.

Overall, there is no doubt that this book is highly significant because of the perspective on schedulers and scheduling that it provides. Much of it, particularly parts 1 and 2, should be read by anybody who does research on scheduling. Even if they intend to continue to focus on developing OR models they should be aware of the context in which any model would have to be used and so they should endeavor to ensure that the assumptions that they make are indeed relevant to the context.

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OPERATIONS SCHEDULING WITH APPLICATIONS IN MANUFACTURING AND SERVICES. Michael Pinedo and Xiuli Chao, McGraw-Hill, New York. ISBN 0-07-289779-1

This useful book, available as both a hardback and a paperback, presents an interesting combination of subjects related to operations scheduling in a variety of settings. The book focuses on scheduling applications, not scheduling theory. It is the book that, in the preface of his 1995 text [1], Pinedo hoped to prepare: 'a second edition in which the applications part will be expanded'. The book focuses on the formulation and solution of scheduling problems and covers a range of industries: manufacturing, airlines, customer service and hospitals. It is intended for undergraduate students and business school students who are studying production and operations management.

Part I (Chapters 1–3) discusses general topics: the role of scheduling, an introduction to scheduling models, and general-purpose procedures (dispatching rules, branch-and-bound and heuristic search) for generating good schedules.

Part II (Chapters 4–9) discusses six specific scheduling models: project scheduling, job shop scheduling, flexible assembly systems, lot sizing and scheduling, reservation systems (including interval scheduling and timetabling), and workforce scheduling. Each chapter presents various versions of each model, discusses solution approaches, and gives small examples that illustrate the idea of the problem and the solution approach.

Part III (Chapters 10–12) discusses scheduling systems. Chapter 10 is a useful introduction on scheduling software, and Chapter 11 describes examples of scheduling in a range of applications. Chapter 12 (entitled 'New Directions') starts by discussing the need for more research on robustness, rescheduling, and multiple objectives. The book does not discuss these important practical considerations elsewhere. The last three topics in Chapter 12 are more closely related to scheduling systems: learning mechanisms, reconfigurable systems, and scheduling systems on the Internet.

The book includes the educational version of the LEKIN scheduling system software. A user's guide is given in an appendix. The software is a very useful tool for learning about scheduling, especially, suited for students who learn by doing. Between the user's guide and the software help screens, it was easy to learn the fundamentals: create a scheduling problem, use a heuristic to generate a schedule and modify the

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schedule. After some practice, generating and comparing multiple schedules was a straightforward task. The educational version can handle deterministic, static scheduling problems for the following environments: single machine, parallel machine, flow shop, job shop, flexible flow shop, and flexible job shop. Each job is described by its routing and the standard job attributes: release date, due date and weight. The user interface presents information clearly and behaves as one would expect. The software includes a number of useful and handy functions that go beyond the obvious, including the ability to use external scheduling algorithms for generating schedules. Because it is the educational version, the software is limited to small problems (at most 10 workcentres and 18 jobs).

Many parts of the new book are similar to material in Reference [1], but the organization and scope of the two works are very different. The first text focused on specific machine scheduling environments (single machine, parallel machine, flow shops, job shops), and it presented theorems and proofs for both deterministic and stochastic models. This material is mostly absent from the new book. However, some familiar material is retained: an introduction to scheduling, a discussion of general purpose procedures, practical scheduling problems, the design of scheduling systems, types of scheduling systems, and an appendix on mathematical programming.

The book is very focused. It discusses in depth topics related to problem formulation and solution and scheduling software. The variety of models and methods are useful for answering questions like: 'If I find myself with a scheduling problem, how can I formulate it? How should I solve it? How can I build software that will collect the necessary data, solve the problem, and present the solution?' However, traditional material on the basic single machine, parallel machine and shop scheduling problems is deliberately excluded.

Unfortunately, the discussion of the role of scheduling in dynamic systems is incomplete. Chapter 6 discusses cyclic schedules for flexible assembly systems. In this environment, it is clear how good operations scheduling improves system performance. Similarly, Chapter 7 presents the economic lot scheduling problem. Solving this determines the system performance on important performance measures such as inventory and setup costs. However, the book does not discuss the impact of operations scheduling on system-level performance measures for dynamic job shops or dynamic reservation systems. The corresponding chapters include only traditional objectives such as makespan or weighted tardiness for a schedule containing a finite set of jobs. Moreover, the book does not mention techniques that require no schedules, such as dispatching rules, pull production control techniques such as kanban and control theoretic approaches.

Although an instructor may want to supplement it with additional material on scheduling theory or scheduling in dynamic manufacturing systems, this book would be a good choice for a course on scheduling because it clearly presents much useful information, and the software is a helpful tool for learning.

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SCHEDULING COMPUTER AND MANUFACTURING PROCESSES (Second Edition). Jacek Błazewicz, Klaus H. Ecker, Erwin Pesch, Günter Schmidt and Jan Węglarz, Springer, Berlin, ISBN 3-540-41931-4

The second edition of this book provides some corrections and new references to the first edition, which in turn is an expansion of an earlier book by four of the current authors [1]. It fairly exhaustively covers standard deterministic scheduling problems, from single machines to job shops, though the details are necessarily omitted for many problem variations. It also describes in depth several more complicated

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