Theory Of Scheduling

A graduate text on theory and methods using applied probability techniques for scheduling service, manufacturing, and information networks.
Introduction to deterministic scheduling theory; Algorithms for minimal-length schedulesComplexity of sequencing problems; Enumerative and iterative computationsl approaches.
Project Scheduling is concerned with the allocation of scarce resources over time. The rich optimisation models with time windows that are treated in this book cover a multitude of practical decision problems arising in diverse application areas such as construction engineering or make-to-order production planning. The book shows how Constraint Propagation techniques from Artificial Intelligence can be successfully combined with Operations Research methods for developing powerful exact and heuristic solution algorithms for a very general class of scheduling problems. Example applications demonstrate the effectiveness of the approach.
Understand common scheduling as well as other advanced operational problems with this valuable reference from a recognized leader in the field.
Beginning with basic principles and an overview of linear and mixed-integer programming, this unified treatment introduces the fundamental ideas underpinning most modeling approaches, and will allow you to easily develop your own models. With more than 150 figures, the basic concepts and ideas behind the development of different approaches are clearly illustrated. Addresses a

wide range of problems arising in diverse industrial sectors, from oil and gas to fine chemicals, and from commodity chemicals to food manufacturing. A perfect resource for engineering and computer science students, researchers working in the area, and industrial practitioners.

The principal theme of this book is combinatorial scheduling. All coverage is confined to deterministic results and includes conventional models involving single and multiple processors as well as ones of the classic flow and job shop-like variety. In addition, the book discusses workforce staffing models, timetabling problems, the classroom assignment model, and even problems related to traversals in graphs. The author has included understandable descriptions of computational algorithms, demonstrations of algorithms and theorems with sample problems, and substantial lists of end-of-chapter exercises which span from relatively routine manipulation to increasingly challenging, possibly even open problems. An entire chapter is included on background material. Covered are basic concepts in computational complexity, the theory of graphs, and partial enumeration. The book should appeal to students and researchers in a host of areas including industrial engineering, operations research, computer science, and discrete mathematics.

Scheduling theory is an important branch of operations research. Problems studied within the framework of that theory have numerous applications in various fields of human activity. As an independent discipline scheduling theory appeared in the middle of the fifties, and has

attracted the attention of researchers in many countries. In the Soviet Union, research in this direction has been mainly related to production scheduling, especially to the development of automated systems for production control. In 1975 Nauka ("Science") Publishers, Moscow, issued two books providing systematic descriptions of scheduling theory. The first one was the Russian translation of the classical book Theory of Scheduling by American mathematicians R. W. Conway, W. L. Maxwell and L. W. Miller. The other one was the book Introduction to Scheduling Theory by Soviet mathematicians V. S. Tanaev and V. V. Shkurba. These books well complement each other. Both. books well represent major results known by that time, contain an exhaustive bibliography on the subject. Thus, the books, as well as the Russian translation of Computer and Job-Shop Scheduling Theory edited by E. G. Coffman, Jr., (Nauka, 1984) have contributed to the development of scheduling theory in the Soviet Union. Many different models, the large number of new results make it difficult for the researchers who work in related fields to follow the fast development of scheduling theory and to master new methods and approaches quickly.

This edited book presents new results in the area of the development of exact and heuristic scheduling algorithms. It contains eight articles accepted for publication for a Special Issue in the journal Algorithms. The book presents new algorithms, e.g., for flow shop, job shop, and parallel machine scheduling problems. The particular articles address subjects such as a heuristic for the routing and scheduling problem with time windows, applied to the automotive industry in Mexico, a heuristic for the blocking job shop problem with

tardiness minimization based on new neighborhood structures, fast heuristics for the Euclidean traveling salesman problem or a new mathematical model for the period-aggregated resource leveling problem with variable job duration, and several others.

An incendiary examination of burnout in millennials--the cultural shifts that got us here, the pressures that sustain it, and the need for drastic change

The theory of scheduling is receiving increased emphasis in research and practice for at least three good reasons. F~~t, the management of large scale projects resolves itself, in the final analysis, into problems of scheduling interacting activities subject to limited resources. Second, a great deal of "fat" that used to exist in the past in production, distribution, and service systems is eliminated, thanks to tighter managerial controls in information systems, in financial management, in logistics, and in many other facets of industrial enterprises and military installations. Tighter scheduling methods are therefore called for. Thi~d, the study of scheduling problems involves the study of combina torial problems and optimization over discrete spaces which represent a radical, and interesting, departure from classical mathematics. This area of study has attracted a good number of distinguished researchers, engineers as well as mathematicians. There is a serious attempt to apply known number theory, and perhaps develop new theory, that would cope with the new problems. The computer enters the picture in novel and ingenious ways, which has not been possible before; etc. To those workinQ in the area, whether in theory or in practice, progress proceeds at an exhilarating pace, with new mathematical structures and computational approaches being continuously introduced to model and solve the problems in novel, and oftentimes ingenious ways.

Scheduling is defined as the process of assigning operations

to resources over time to optimize a criterion. Problems with scheduling comprise both a set of resources and a set of a consumers. As such, managing scheduling problems involves managing the use of resources by several consumers. This book presents some new applications and trends related to task and data scheduling. In particular, chapters focus on data science, big data, high-performance computing, and Cloud computing environments. In addition, this book presents novel algorithms and literature reviews that will guide current and new researchers who work with load balancing, scheduling, and allocation problems.

Scheduling and multicriteria optimisation theory have been subject, separately, to numerous studies. Since the last fifteen years, multicriteria scheduling problems have been subject to a growing interest. However, a gap between multicriteria scheduling approaches and multicriteria optimisation field exists. This book is a first attempt to collect the elementary of multicriteria optimisation theory and the basic models and algorithms of multicriteria scheduling. It is composed of numerous illustrations, algorithms and examples which may help the reader in understanding the presented concepts.

This is a comprehensive study of various time-dependent scheduling problems in single-, parallel- and dedicated-machine environments. In addition to complexity issues and exact or heuristic algorithms which are typically presented in scheduling books, the author also includes more advanced topics such as matrix methods in time-dependent scheduling, time-dependent scheduling with two criteria and time-dependent two-agent scheduling. The reader should be familiar with the basic notions of calculus, discrete mathematics and combinatorial optimization theory, while the book offers introductory material on theory of algorithms, NP-complete problems, and the basics of scheduling theory. The

author includes numerous examples, figures and tables, he presents different classes of algorithms using pseudocode, he completes all chapters with extensive bibliographies, and he closes the book with comprehensive symbol and subject indexes. The previous edition of the book focused on computational complexity of time-dependent scheduling problems. In this edition, the author concentrates on models of time-dependent job processing times and algorithms for solving time-dependent scheduling problems. The book is suitable for researchers working on scheduling, problem complexity, optimization, heuristics and local search algorithms.

The purpose of this paper is to formulate a number of significant mathematical problems which have arisen in connection with the theory of scheduling, and to discuss the methods which have been devised to treat these problems. (Author).

An updated edition of the text that explores the core topics in scheduling theory The second edition of Principles of Sequencing and Scheduling has been revised and updated to provide comprehensive coverage of sequencing and scheduling topics as well as emerging developments in the field. The text offers balanced coverage of deterministic models and stochastic models and includes new developments in safe scheduling and project scheduling, including coverage of project analytics. These new topics help bridge the gap between classical scheduling and actual practice. The authors—noted experts in the field—present a coherent and detailed introduction to the basic models, problems, and methods of scheduling theory. This book offers an introduction and overview of sequencing and scheduling

and covers such topics as single-machine and multi-machine models, deterministic and stochastic problem formulations, optimization and heuristic solution approaches, and generic and specialized software methods. This new edition adds coverage on topics of recent interest in shop scheduling and project scheduling. This important resource: Offers comprehensive coverage of deterministic models as well as recent approaches and developments for stochastic models Emphasizes the application of generic optimization software to basic sequencing problems and the use of spreadsheet-based optimization methods Includes updated coverage on safe scheduling, lognormal modeling, and job selection Provides basic coverage of robust scheduling as contrasted with safe scheduling Adds a new chapter on project analytics, which supports the PERT21 framework for project scheduling in a stochastic environment. Extends the coverage of PERT 21 to include hierarchical scheduling Provides end-of-chapter references and access to advanced Research Notes, to aid readers in the further exploration of advanced topics Written for upper-undergraduate and graduate level courses covering such topics as scheduling theory and applications, project scheduling, and operations scheduling, the second edition of Principles of Sequencing and Scheduling is a resource that covers scheduling techniques and contains the most current research and emerging topics.

This book explores how the television industry is adapting its production culture and professional practises of scheduling to an increasingly non-linear television

paradigm, a testing ground where different communicative tools are tried out in a volatile industry. Based on four case studies the book argues that a new television paradigm is being produced from within the multiplatform television organisations themselves in order to adapt to changing viewer habits and the tensions between digital and broadcast television. Drawing on a unique genre and production studies approach that cuts across the humanities and sociology in television studies, chapters cover in-depth studies of: • The communicative changes to the on-air schedule as a televisual text phenomenon in the digital era, and how the conceptualisations of the audience are changing in scheduling and curation for multiplatform portfolios • The changing production culture of scheduling in companies for their multiplatform portfolios • The dilemmas of curation in multiplatform portfolios. Situated at the intersection of the humanities and sociology in media production studies, this book will be of key interest to scholars and students of television studies, media production studies and cultural studies and to researchers and media professionals and management in the television industry.

This comprehensive text explores the mathematical models underlying the theory of scheduling. Organized according to scheduling problem type, it examines three solution techniques: algebraic, probabilistic, and Monte Carlo simulation by computer. Topics include problems of sequence, measures for schedule evaluation, finite sequencing for a single machine, and further problems with one operation per job. Additional chapters cover

flow-shop scheduling, the general n/m job-shop problem, general network problems related to scheduling, selection disciplines in a single-server queuing system, single-server queuing systems with setup classes, multiple-server queuing models, and experimental investigation of the continuous job-shop process. 1967 edition.

The scheduling research field has been active and expanding for over forty years. In that time, the field has attracted a wealth of international interest from a variety of academic disciplines. This field has been a truly inter-disciplinary research area, with significant scientific advances have come from the disciplines of Information Technology and Computer Science, Mathematics and Operations Research, Manufacturing, Management, Business, Engineering, Psychology and Statistics. Nevertheless, after forty years of research, scheduling and IT systems have only scratched the surface of the benefits that can be realized from this field. MULTIDISCIPLINARY SCHEDULING: Theory and Applications is a volume of nineteen reviewed papers that were selected from the sixty-seven papers presented during the First Multidisciplinary International Conference of Scheduling: Theory and Applications (MISTA). This is the initial volume of MISTA—the primary forum on interdisciplinary research on scheduling. Each paper in the volume has been rigorously reviewed and carefully copyedited to ensure the volume's readability. The book contains leading edge papers on the fundamentals of scheduling, multi-criteria objective scheduling, personnel scheduling, scheduling in space,

scheduling the Internet, machine scheduling, bin packing, educational timetabling, sports scheduling, transport scheduling, aircraft scheduling, and heuristic and meta-heuristic scheduling. The MISTA volume aims to help set the agenda for interdisciplinary scheduling research and to help the community carryout a long term interdisciplinary research program aimed at developing visionary approaches to the scheduling problems and scheduling related problems of today and tomorrow that are vital to the smooth and efficient running of industry, commerce and the service sector. The book will be of interest to all who need to know the state-of-the-art in scheduling, whether they are experienced or new to the area.

Focusing on theory and applications of scheduling, the applications are drawn primarily from production and manufacturing environments, but state principles that are relevant to other settings as well. The broad range of topics includes deterministic and stochastic models.

Network Flow, Transportation, and Scheduling; Theory and Algorithms

An up-to-date and comprehensive treatment of the fundamentals ofscheduling theory, including recent advances and state-of-the-arttopics Principles of Sequencing and Scheduling strikes a unique balancebetween theory and practice, providing an accessible introductionto the concepts, methods, and results of scheduling theory and itscore topics. With real-world examples and up-to-date modelingtechniques, the book equips readers with the basic knowledge neededfor understanding scheduling theory and delving into

itsapplications. The authors begin with an introduction and overviewof sequencing and scheduling, including single-machine sequencing,optimization and heuristic solution methods, and models withearliness and tardiness penalties. The most current material onstochastic scheduling, including correct scheduling of safety timeand the use of simulation for optimization, is then presented andintegrated with deterministic models. Additional topical coverageincludes: Extensions of the basic model Parallel-machine models Flow shop scheduling Scheduling groups of jobs The job shop problem Simulation models for the dynamic job shop Network methods for project scheduling Resource-constrained project scheduling Stochastic and safe scheduling Extensive end-of-chapter exercises are provided, some of whichare spreadsheet-oriented, and link scheduling theory to the mostpopular analytic platform among today's students andpractitioners—the Microsoft Office Excel® spreadsheet.Extensive references direct readers to additional literature, andthe book's related Web site houses material that reinforces thebook's concepts, including research notes, data sets, and examplesfrom the text. Principles of Sequencing and Scheduling is an excellent book forcourses on sequencing and scheduling at the upper-undergraduate andgraduate levels. It is also a valuable reference for researchersand practitioners in the fields of statistics, computer science,operations research, and engineering. Covering deterministic scheduling, stochastic scheduling, and the probabilistic analysis of algorithms, this unusually broad view of the subject brings together

tutorials, surveys and articles with original results from foremost international experts. The contributions reflect the great diversity in scheduling theory in terms of academic disciplines, applications areas, fundamental approaches and mathematical skills. This book will help researchers to be aware of the progress in the various areas of specialization and the possible influences that this progress may have on their own specialities. Few disciplines are driven so much by continually changing and expanding technology, a fact that gives scheduling a permanence while adding to the excitement of designing and analyzing new systems. The book will be a vital resource for researchers and graduate students of computer science, applied mathematics and operational research who wish to remain up-to-date on the scheduling models and problems of many of the newest technologies in industry, commerce, and the computer and communications sciences.

In this book . . . Nicolas Vandeput hacks his way through the maze of quantitative supply chain optimizations. This book illustrates how the quantitative optimization of 21st century supply chains should be crafted and executed. . . . Vandeput is at the forefront of a new and better way of doing supply chains, and thanks to a richly illustrated book, where every single situation gets its own illustrating code snippet, so could you. --Joannes Vermorel, CEO, Lokad Inventory Optimization argues that mathematical inventory models can only take us so far with supply chain management. In order to optimize inventory policies, we have to use probabilistic simulations. The book explains how to implement these

models and simulations step-by-step, starting from simple deterministic ones to complex multi-echelon optimization. The first two parts of the book discuss classical mathematical models, their limitations and assumptions, and a quick but effective introduction to Python is provided. Part 3 contains more advanced models that will allow you to optimize your profits, estimate your lost sales and use advanced demand distributions. It also provides an explanation of how you can optimize a multi-echelon supply chain based on a simple—yet powerful—framework. Part 4 discusses inventory optimization thanks to simulations under custom discrete demand probability functions. Inventory managers, demand planners and academics interested in gaining cost-effective solutions will benefit from the "do-it-yourself" examples and Python programs included in each chapter.

Overview and Goals This book is dedicated to scheduling for parallel processing. Presenting a research ?eld as broad as this one poses considerable dif?culties. Scheduling for parallel computing is an interdisciplinary subject joining many ?elds of science and te- nology. Thus, to understand the scheduling problems and the methods of solving them it is necessary to know the limitations in related areas. Another dif?culty is that the subject of scheduling parallel computations is immense. Even simple search in bibliographical databases reveals thousands of publications on this topic. The - versity in understanding scheduling problems is so great that it seems impossible to juxtapose them in one scheduling taxonomy. Therefore, most of the papers on scheduling

for parallel processing refer to one scheduling problem resulting from one way of perceiving the reality. Only a few publications attempt to arrange this ?eld of knowledge systematically. In this book we will follow two guidelines. One guideline is a distinction - tween scheduling models which comprise a set of scheduling problems solved by dedicated algorithms. Thus, the aim of this book is to present scheduling models for parallel processing, problems de?ned on the grounds of certain scheduling models, and algorithms solving the scheduling problems. Most of the scheduling problems are combinatorial in nature. Therefore, the second guideline is the methodology of computational complexity theory.

Inthisbookwepresentfourexamplesofschedulingmodels. Wewillgodeepinto the models, problems, and algorithms so that after acquiring some understanding of them we will attempt to draw conclusions on their mutual relationships.

This new edition provides an up-to-date coverage of important theoretical models in the scheduling literature as well as significant scheduling problems that occur in the real world. It again includes supplementary material in the form of slide-shows from industry and movies that show implementations of scheduling systems. The main structure of the book as per previous edition consists of three parts. The first part focuses on deterministic scheduling and the related combinatorial problems. The second part covers probabilistic scheduling models; in this part it is assumed that processing times and other problem data are random and not known in advance.

The third part deals with scheduling in practice; it covers heuristics that are popular with practitioners and discusses system design and implementation issues. All three parts of this new edition have been revamped and streamlined. The references have been made completely up-to-date. Theoreticians and practitioners alike will find this book of interest. Graduate students in operations management, operations research, industrial engineering, and computer science will find the book an accessible and invaluable resource. Scheduling - Theory, Algorithms, and Systems will serve as an essential reference for professionals working on scheduling problems in manufacturing, services, and other environments.

Both process planning and scheduling are very important functions of manufacturing, which affect together the cost to manufacture a product and the time to deliver it. This book contains various approaches proposed by researchers to integrate the process planning and scheduling functions of manufacturing under varying configurations of shops. It is useful for both beginners and advanced researchers to understand and formulate the Integration Process Planning and Scheduling (IPPS) problem effectively. Features Covers the basics of both process planning and scheduling Presents nonlinear approaches, closed-loop approaches, as well as distributed approaches Discuss the outfit of IPPS in Industry 4.0 paradigm Includes the benchmarking problems on IPPS Contains nature-algorithms and metaheuristics for performance measurements in IPPS Presents analysis of energy-efficient objective for sustainable manufacturing in IPPS

This book is intended to be a teaching aid for students of the

courses in Operations Research and Mathematical Optimization for scientific faculties. Some of the basic topics of Operations Research and Optimization are considered: Linear Programming, Integer Linear Programming, Computational Complexity, and Graph Theory. Particular emphasis is given to Integer Linear Programming, with an exposition of the most recent resolution techniques, and in particular of the branch-and-cut method. The work is accompanied by numerous examples and exercises.

In this thesis we advance the state-of the practice in the Space Mission Operations domain by leveraging single spacecraft technologies along with classical scheduling frameworks and notation to create a scheduler for a constellation of spacecraft. We define a scheduling product that is focused on the problem of scheduling networked groups of spacecraft, called constellations. Within this thesis we show that the constellation schedule problem is a very complex problem, and the application of heuristics is one approach that allow us to schedule successfully. Our first objective, comprising chapters 1, 2, and 3, is to describe the spacecraft constellation domain and the objectives of the thesis. This background provides a foundation for understanding the constellation scheduling problem domain. Our second objective, comprising chapters 4, 5 and 6, is to provide a representation and description of the components of a constellation system, and a formal definition of the constellation schedule problem via existing formal scheduling frameworks and notation. Our third objective, comprising chapter 7, is to use these frameworks to allow us to deduce the complexity of the problem. Our fourth objective, comprising chapter 8, is to present techniques that allow us to leverage single spacecraft scheduling techniques to construct a constellation scheduler. Our final objective, comprising chapter 9, is to propose a scheduler architecture that satisfies

a typical constellation scheduling problem.