

Oded Maimon, Eugene Khmelnitsky
and Konstantin Kogan

OPTIMAL FLOW CONTROL IN MANUFACTURING SYSTEMS

Production Planning and
Scheduling

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Optimal Flow Control In Manufacturing Systems



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Optimal Flow Control In Manufacturing Systems:

Optimal Flow Control in Manufacturing Systems O. Maimon, E. Khmelnitsky, K. Kogan, 2013-03-09 This book presents a unified optimal control approach to a large class of problems arising in the field of production planning and scheduling. It introduces a leading optimal flow control paradigm which results in efficient solutions for planning and scheduling problems. This book also introduces the reader to analytical and numerical methods of the maximum principle used here as a mathematical instrument in modeling and solving production planning and scheduling problems. The book examines control of production flows rather than sequencing of distinct jobs. Methodologically, this paradigm allows us to progress from initial assumptions about a manufacturing environment through mathematical models and construction of numerical methods up to practical applications which prove the relevance of the theory developed here to the real world. Given a manufacturing system, the goal is to control the production subject to given constraints in such a way that the demands are tracked as closely as possible. The book considers a wide variety of problems encountered in actual production planning and scheduling. Among the problems are production flow sequencing and timing, capacity expansion and deterioration, subcontracting and overtime. The last chapter is entirely devoted to applications of the theory to scheduling production flows in real life manufacturing systems. The enclosed disk provides software implementations of the developed methods with easy convenient user interface. We aimed this book at a student audience: final year undergraduates as well as master and Ph D.

Optimal Flow Control in Manufacturing Systems O. Maimon, Eugene Khmelnitsky, K. Kogan, 1998-08-31 This book presents a unified optimal control approach to a large class of problems arising in the field of production planning and scheduling. It introduces a leading optimal flow control paradigm which results in efficient solutions for planning and scheduling problems. This book also introduces the reader to analytical and numerical methods of the maximum principle used here as a mathematical instrument in modeling and solving production planning and scheduling problems. The book examines control of production flows rather than sequencing of distinct jobs. Methodologically, this paradigm allows us to progress from initial assumptions about a manufacturing environment through mathematical models and construction of numerical methods up to practical applications which prove the relevance of the theory developed here to the real world. Given a manufacturing system, the goal is to control the production subject to given constraints in such a way that the demands are tracked as closely as possible. The book considers a wide variety of problems encountered in actual production planning and scheduling. Among the problems are production flow sequencing and timing, capacity expansion and deterioration, subcontracting and overtime. The last chapter is entirely devoted to applications of the theory to scheduling production flows in real life manufacturing systems. The enclosed disk provides software implementations of the developed methods with easy convenient user interface. We aimed this book at a student audience: final year undergraduates as well as master and Ph D.

Maintenance, Modeling and Optimization Mohamed Ben-Daya, Salih O. Duffuaa, Abdul Raouf, 2012-12-06 Production costs

are being reduced by automation robotics computer integrated manufacturing cost reduction studies and more These new technologies are expensive to buy repair and maintain Hence the demand on maintenance is growing and its costs are escalating This new environment is compelling industrial maintenance organizations to make the transition from fixing broken machines to higher level business units for securing production capacity On the academic front research in the area of maintenance management and engineering is receiving tremendous interest from researchers Many papers have appeared in the literature dealing with the modeling and solution of maintenance problems using operations research OR and management science MS techniques This area represents an opportunity for making significant contributions by the OR and MS communities Maintenance Modeling and Optimization provides in one volume the latest developments in the area of maintenance modeling Prominent scholars have contributed chapters covering a wide range of topics We hope that this initial contribution will serve as a useful informative introduction to this field that may permit additional developments and useful directions for more research in this fast growing area The book is divided into six parts and contains seventeen chapters Each chapter has been subject to review by at least two experts in the area of maintenance modeling and optimization The first chapter provides an introduction to major maintenance modeling areas illustrated with some basic models Part II contains five chapters dealing with maintenance planning and scheduling Part III deals with preventive maintenance in six chapters Part IV focuses on condition based maintenance and contains two chapters Part V deals with integrated production and maintenance models and contains two chapters Part VI addresses issues related to maintenance and new technologies and also deals with Just in Time JIT and Maintenance

Essays on Pollution Control in Economics and Management Science Fouad El Ouardighi, 2025-04-25 The book features contributions that address both environmental economics and environmental management It presents a novel dynamic modeling framework for environmental economics in which environmental absorption efficiency is considered as a time dependent variable with its own dynamics It also introduces several extensions and applications of the model including the possibility of including self regenerating environmental absorption efficiency non cooperative transboundary issues with two superimposed free rider behaviors i e emissions reduction and restoration efforts and deforestation In the environmental management context it puts forward an entirely new dynamic modeling framework Unlike static approaches the model considers both flow and stock variables reflecting the accumulation of pollution over time In turn the book assesses sustainable configurations for supply chain competition providing mathematical insights and managerial recommendations that integrate accumulated pollution aspects and associated negative externalities Overall the book calls for combining environmental economics and environmental management in order to arrive at more realistic empirically grounded models Given its focus the book offers a valuable resource for researchers and graduate students with an interest in addressing pollution control challenges in the fields of economics and management science

Discrete Event Systems 2004 (WODES'04) Janan Zaytoon, 2005-12-22 Approx

484 pages *Computer control of flexible manufacturing systems* S. Joshi, J.S. Smith, 2012-12-06 With the approach of the 21st century and the current trends in manufacturing the role of computer controlled flexible manufacturing an integral part in the success of manufacturing enterprises will take Manufacturing environments are changing to small batch with batch sizes diminishing to a quantity of one larger product variety production on demand with low lead times with the ability to be agile This is in stark contrast to conventional manufacturing which has relied on economies of scale and where change is viewed as a disruption and is therefore detrimental to production Computer integrated manufacturing CIM and flexible manufacturing practices are a key component in the transition from conventional manufacturing to the new manufacturing environment While the use of computers in manufacturing from controlling individual machines NC Robots AGVs etc to controlling flexible manufacturing systems FMS has advanced the flexibility of manufacturing environments it is still far from reaching its full potential in the environment of the future Great strides have been made in individual technologies and control of FMS has been the subject of considerable research but computerized shop floor control is not nearly as flexible or integrated as hyped in industrial and academic literature In fact the integrated systems have lagged far behind what could be achieved with existing technology *Optimization Models and Concepts in Production Management*

Bradimaarte, 1995-04-13 Optimization techniques in production management are becoming increasingly important for efficient and competitive manufacturing This book presents a collection of tutorial papers by outstanding researchers on the application of optimization concepts Topics introduced include hierarchical production planning and large scale scheduling optimal production control exact and heuristic algorithms for production scheduling and stochastic modelling

Mechatronics in Engineering Design and Product Development Dobrivojic Popovich, 1998-09-30 This work presents a systematic and comprehensive overview to the theory and applications of mechatronic processes emphasizing the adaptation and incorporation of this important tool in fulfilling desired performance and quality requirements The authors address the core technologies needed for the design and development of the mechatronic product cover design approaches discuss related mechatronic product design aspects and detail mechatronic product application examples Hierarchical Decision Making in Stochastic Manufacturing Systems Suresh P. Sethi, Qing Zhang, 2012-12-06 One of the most important methods in dealing with the optimization of large complex systems is that of hierarchical decomposition The idea is to reduce the overall complex problem into manageable approximate problems or subproblems to solve these problems and to construct a solution of the original problem from the solutions of these simpler problems Development of such approaches for large complex systems has been identified as a particularly fruitful area by the Committee on the Next Decade in Operations Research 1988 42 as well as by the Panel on Future Directions in Control Theory 1988 65 Most manufacturing firms are complex systems characterized by several decision subsystems such as finance personnel marketing and operations They may have several plants and warehouses and a wide variety of machines and equipment devoted to producing a large number of different

products Moreover they are subject to deterministic as well as stochastic discrete events such as purchasing new equipment hiring and layoff of personnel and machine setups failures and repairs

Supply Chain Games: Operations

Management and Risk Valuation Konstantin Kogan, Charles S. Tapiero, 2007-09-05 In today's global economy supply chains are an essential ingredient to corporate survival and growth Operations strategy in supply chains must assume an ever expanding and strategic role of risks that modern enterprises face when they operate in an interdependent supply chain environment These operational and strategic facets entail a brand new set of operational problems and risks that have not always been understood or managed very well It falls to supply chain managers to identify and to educate corporate managers on what these critical operational problems and risks involve Supply Chain Games Operations Management and Risk Valuation provides business students and practitioners with the means to understand to model and to analyze these outstanding issues and problems that are the essential elements in managing supply chains today

Current Trends in Nonlinear Systems and Control Petar V. Kokotović, Turi Nicosia, Laura Menini, Luca Zaccarian, Chaouki T. Abdallah, 2006

This volume is an outgrowth of the workshop Applications of Advanced Control Theory to Robotics and Automation organized in honor of the 70th birthdays of Petar V Kokotovic and Salvatore Nicosia Both Petar and Turi have carried out distinguished work in the control community and have long been recognized as mentors as well as experts and pioneers in the field of automatic control covering many topics in control theory and several different applications The variety of their research is reflected in this book which includes contributions ranging from mathematics to laboratory experiments Main topics covered include Observer design for time delay systems nonlinear systems and identification for different classes of systems Lyapunov tools for linear differential inclusions control of constrained systems and finite time stability concepts New studies of robot manipulators parameter identification and different control problems for mobile robots Applications of modern control techniques to port controlled Hamiltonian systems different classes of vehicles and web handling systems Applications of the max plus algebra to system order reduction optimal machine scheduling problems and inventory control with cooperation between retailers Control of linear and nonlinear networked control systems deterministic and stochastic approaches The scope of the work is very broad and although each chapter is self contained the book has been organized into thematically related chapters which in some cases suggest to the reader a convenient reading sequence The great variety of topics covered and the almost tutorial writing style used by many of the authors will make this book suitable for experts as well as young researchers who seek a more intuitive understanding of these relevant topics in the field

Lean Production for Competitive Advantage John Nicholas, 2015-10-08

The Lean concepts and principles described in this book have revolutionized manufacturing practice and business conduct in a manner similar to what Henry Ford's system did for mass manufacturing Lean production however involves much more than the adoption of methods and procedures it requires a change in management philosophy that emphasizes relationship building trust and responsibility being conferred to frontline

workers and suppliers Based on three decades of teaching experience Lean Production for a Competitive Advantage A Comprehensive Guide to Lean Methodologies and Management Practices introduces the Lean philosophy and illustrates the effective application of Lean tools with real world case studies From fundamental concepts to integrated planning and control in pull production and the supply chain the text provides a complete introduction to Lean production Coverage includes small batch production setup reduction pull production preventive maintenance standard operations as well as synchronizing and scheduling lean operations Detailing the key principles and practices of Lean production the text also Illustrates effective implementation techniques with case studies from a range of industries Includes questions and completed problems in each chapter Explains how to effectively partner with suppliers and employees to accomplish productivity goals Designed for students who have a basic foundation in production and operations management the text provides a thorough understanding of the fundamental principles of Lean It also offers practical know how for implementing a culture of continuous improvement on the shop floor or in the office creating a heightened sense of responsibility and pride in all stakeholders involved and enhancing productivity and efficiency to improve the bottom line Instructor s material available please contact orders taylorandfrancis com or call 1 800 634 7064 to request these materials Handbook of Maintenance Management and Engineering Mohamed Ben-Daya, Salih O. Duffuaa, Abdul Raouf, Jezdimir Knezevic, Daoud Ait-Kadi, 2009-07-30 To be able to compete successfully both at national and international levels production systems and equipment must perform at levels not even thinkable a decade ago Requirements for increased product quality reduced throughput time and enhanced operating effectiveness within a rapidly changing customer demand environment continue to demand a high maintenance performance In some cases maintenance is required to increase operational effectiveness and revenues and customer satisfaction while reducing capital operating and support costs This may be the largest challenge facing production enterprises these days For this maintenance strategy is required to be aligned with the production logistics and also to keep updated with the current best practices Maintenance has become a multidisciplinary activity and one may come across situations in which maintenance is the responsibility of people whose training is not engineering This handbook aims to assist at different levels of understanding whether the manager is an engineer a production manager an experienced maintenance practitioner or a beginner Topics selected to be included in this handbook cover a wide range of issues in the area of maintenance management and engineering to cater for all those interested in maintenance whether practitioners or researchers This handbook is divided into 6 parts and contains 26 chapters covering a wide range of topics related to maintenance management and engineering *Hybrid Systems III* Rajeev Alur, Thomas A. Henzinger, Eduardo D. Sontag, 1996-04-24 This reference book documents the scientific outcome of the DIMACS SYCON Workshop on Verification and Control of Hybrid Systems held at Rutgers University in New Brunswick NJ in October 1995 A hybrid system consists of digital devices that interact with analog environments Computer science contributes expertise on the analog aspects of this

emerging field of interdisciplinary research and design The 48 revised full papers included were strictly refereed they present the state of the art in this dynamic field with contributions by leading experts Also available are the predecessor volumes published in the same series as LNCS 999 and LNCS 736 **Integrated Models in Production Planning, Inventory, Quality, and Maintenance** M.A. Rahim, Mohamed Ben-Daya, 2012-12-06 Production planning inventory management quality control and maintenance policy are critical components of the manufacturing system The effective integration of these four components gives a manufacturing operation the competitive edge in today's global market place Integrated Models in Production Planning Inventory Quality and Maintenance provides in one volume the latest developments in the integration of production quality and maintenance models Prominent researchers who are actively engaged in these areas have contributed the topical chapters focused on the most recent issues in the area In Part I Ben Daya and Rahim provide an overview of the literature dealing with integrated models for production quality and maintenance Directions for future research are outlined Part II contains six chapters chapters 2 to 6 dealing with integrated models for production and maintenance Part III deals with integrated production inventory and quality models in chapters 7 11 Part IV focuses on quality and maintenance integrated models and contains two chapters Part V deals with warranty manufacturing and quality and contains two chapters Part VI addresses issues related to quality and contains three chapters chapters 16 18

INTERNATIONAL JOURNAL OF PRODUCTION ECONOMICS: MANUFACTURING SYSTEMS, STRATEGY & DESIGN, 1987 **Mathematics of Stochastic Manufacturing Systems** George Yin, Qing Zhang, 1997-01-01 In this volume leading experts in mathematical manufacturing research and related fields review and update recent advances of mathematics in stochastic manufacturing systems and attempt to bridge the gap between theory and applications The topics covered include scheduling and production planning modeling of manufacturing systems hierarchical control for large and complex systems Markov chains queueing networks numerical methods for system approximations singular perturbed systems risk sensitive control stochastic optimization methods discrete event systems and statistical quality control **Lean Production for Competitive Advantage** DR. JOHN NICHOLAS, 2018-03-15 Lean Production for Competitive Advantage A Comprehensive Guide to Lean Methodologies and Management Practices Second Edition introduces Lean philosophy and illustrates the effective application of Lean tools with real world case studies From fundamental concepts to integrated planning and control in pull production and the supply chain the text provides a complete introduction to Lean production Coverage includes small batch production setup reduction pull production preventive maintenance standard work as well as synchronizing and scheduling Lean operations Detailing the key principles and practices of Lean production the text also Illustrates effective implementation techniques with case studies from a range of industries Includes questions and completed problems in each chapter Explains how to effectively partner with suppliers and employees to achieve productivity goals Designed for students who have a basic foundation in production and operations management the text provides a

thorough understanding of the principles of Lean It also offers practical know how for implementing a culture of continuous improvement on the shop floor and in the office creating a heightened sense of responsibility in all stakeholders and enhancing productivity and efficiency to improve the bottom line In this second edition the author addresses management s role in Lean production Early observers of Japanese methods focused on the shop floor to see amazing things unlike anything practiced elsewhere And the thinking was if the methods could be adopted by companies elsewhere those companies would experience the success of the Japanese What the early observers hadn t considered were dramatic differences in the way those companies were managed both daily and strategically The management side of Lean production is addressed in two new chapters one devoted to daily management the other to strategy deployment Additionally there is a new chapter that addresses breakthrough improvement and an approach to achieving it called Production Preparation Process Every chapter has been revised and expanded to better tell the story of Lean production its history applications practices and methods

The Business Plan Gerald Schwetje, Sam Vaseghi, 2007-08-24 In starting a new enterprise one must be able to both plan and realize their initial goal This book provides the budding entrepreneur with the essentials needed to draw up and execute a successful business plan The implementation of the many methods presented in this title have been exercised for years both in practice and in real world management consulting situations By laying out a straightforward blueprint for the reader this title s pragmatic emphasis and autodidactic approach allows for easy absorption of the necessary skills and tools required for the planning and development of a new business venture Each section of the book closes with a set of key questions thusly providing a roadmap for building a successful business from the planning stage to successful marketing to finding investors It is with this book s method that the reader is able to weigh the real risks associated with business formation

Flexible Manufacturing Systems Zubair M. Mohamed, 2018-07-27 Originally published in 1994 this book undertakes a comprehensive study dealing with the effects of machine flexibility tool magazine capacity varying production demands and different operating policies on the production planning problems Performance measures such as FMS flexibility makespan and inventory are used in evaluating the effects Three measures of FMS flexibility actual routing flexibility potential routing flexibility and capacity flexibility are defined and operationalized

Reviewing **Optimal Flow Control In Manufacturing Systems**: Unlocking the Spellbinding Force of Linguistics

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