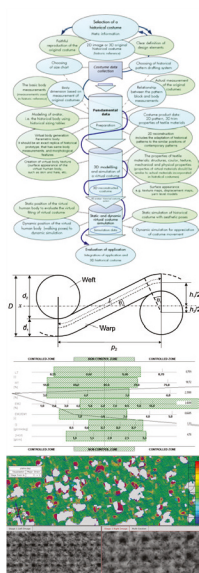
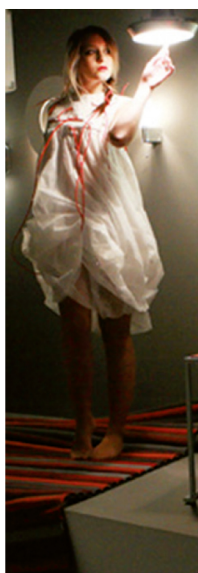


Design of Clothing Manufacturing Processes

A Systematic Approach to
Developing, Planning, and Control

Second Edition



Jelka Geršak

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The Textile Institute Book Series

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Planning, and Control

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Foreword: Design of clothing manufacturing processes

A lot has been said about the textile and garment industry, its global reach, and its economics. A lot has also been written about its supply chain and its sectors, and that each sector has unique materials, products, and processes. The industry rightly emphasises the importance of companies that manufacture fibres, yarns, fabrics or garments.

What holds the label however is the garment, and in this context, there are not many books that deal with the design and clothing manufacturing process in such a systematic approach so that knowledge and expertise are transferred to the reader through more as 300 pages consisting of 9 chapters.

The book sets the scene by classifying clothing and discussing its marketplace; it then goes on to look at clothing sizing before describing how a garment collection is made: an important aspect in the manufacture, production, and selling of garments. In [Chapter 4](#), garment customisation from the digital perspective is discussed incorporating scientific aspects of fabric modelling, simulation, and digital fitting and ending with e-commerce. [Chapters 5 and 6](#) are dedicated to production planning and control, going into much detail about the processes of design, pattern making, and pattern cutting. Clothing manufacturing planning and the behaviour, performance, and quality of materials is the jewel in this book that everybody should study. [Chapter 9](#) deals with one of my favourite and somewhat forgotten subjects of sewability and seam performance. Professor Jelka Gersak, the author of this book, binds together all the nine chapters very eloquently and gives valuable perspectives for the future.

The author is one of the living experts in the field. Her expertise is gained by many years of her tireless research and dedication in these topics, and it is a privilege that they are now presented in the book. The fact that the book is updated with new knowledge for a second edition speaks for its importance and popularity. This study fills a gap in the public domain, aiming at undergraduates, postgraduates, researchers, and industrialists alike.

I am honoured and happy to introduce this timely book and my wishes for a successful journey.

George K. Stylios

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Preface

From a historical perspective, fashion was an expression of culture, geography, climate, status, and personal taste. It was synonymous with what was considered beautiful. Changing aesthetic ideals, climate changes, and ever-louder calls for the use of environmentally friendly materials, as well as the Fashion Industry 4.0, in which cyber-physical systems can be used in manufacturing to fulfil the vision of producing personalised clothing on a large scale, have influenced fashion and led to the transformation of the clothing industry. It is a socially conscious movement that is shifting consumer consciousness from quantity to quality and from mass-produced products to sustained and personalised clothing.

This requires new approaches and solutions, as well as radical changes throughout the textile and clothing chain. These changes focus on key elements such as:

- creativity in design as a driver of user-centred innovation;
- innovation in materials and processes;
- innovation in technologies that represent the ideals and principles of the Fashion Industry 4.0;
- production systems that convert demand information into products with supporting resources, raw materials, and parts, which drives the overall system;
- flexibility in manufacture, and the management in the supply chain;
- ‘fashion’ and ‘technology’, merged into ‘smart products’ that combine the physical and digital dimensions into cyber-physical systems; and
- high-quality products and development of new marketing models, linked to the different actors that make up the new digital environment, as well as new services focused on customer’s needs.

In addition, today’s rapidly globalising business world, where IT is constantly producing new technologies, is having a revolutionary impact on the evolution of fashion design and manufacturing processes. The conventional borders between product design, production, and the user are being merged. Digital and communication technologies enable the co-design of products or/and services that can fully engage with users. This presents us with new challenges, not only in developing knowledge on how to design better products and services, but also the need to design better clothing manufacturing processes to help the clothing industry to compete more effectively.

This second edition of the monograph aims to provide a critical appreciation of technological development and scientific understanding in areas related to the design of conventional and advanced clothing manufacturing processes, from basic theory and definitions to technical standards and formulae in response to the search for new approaches related to new applications, slow fashion, knowledge of success drivers in the development of a new product, and the digital transformation that requires new marketing models and tools within the fashion e-commerce.

The content is divided into nine chapters that provide a critical overview of the key aspects of designing faster, more integrated, and more flexible clothing manufacturing processes. [Chapter 1](#) presents and discusses a comprehensive overview of clothing classification systems from anthropometric and engineering perspectives, as well as definitions and terminologies for individual clothing types. To manage global production operations with designers, fabric manufacturers, clothing manufacturers, retailers, and customers scattered across multiple locations, knowledge of common clothing classification systems based on appropriate terminology is essential. A similar need for standardisation exists in the area of clothing sizing. [Chapter 2](#), therefore, provides an overview of the development and analysis of clothing sizing and design systems, which details international, European, and American sizing systems.

The development of fashion collection and digital fashion occupy an important place in the design of clothing manufacturing processes, mainly because in this field, information and communication technologies first came to the fore, accelerating the transition from analogue to digital technology. [Chapter 3](#), therefore, focuses on fashion collection development, including the key functions in new product development, the role of design, and the critical factors behind a new product, whilst [Chapter 4](#) presents a digital fashion, a terminological overview of the digital fitting system and review research and development in virtual clothing simulation and fitting. These chapters provide the context for designing particular clothing manufacturing processes.

The following chapters discuss key aspects of the design of clothing production planning. [Chapter 5](#) discusses important terms and roles in clothing production planning and control. It reviews issues and documentation of design analysis and activity planning. Specific issues of clothing design, pattern making, and cutting are discussed in [Chapter 6](#). [Chapter 7](#) deals with planning clothing manufacturing operations, including joining techniques, work analysis, as well as planning manufacturing operations, and clothing manufacturing processes. Quality requirements for clothing materials, definitions, and minimum quality standards for performance characteristics as well as the basic requirement for the mechanical and physical properties of clothing materials are covered in [Chapter 8](#). [Chapter 9](#), the last chapter, provides an overview of the background knowledge of seam performance as an important criterion for the product quality and explains the theoretical basis for determining stitched seam strength of clothing as a function of the mechanics of the transformation of the tensile load of the thread system in the fabric and the effect on the sewing thread in the seam. The central part of the content is focused on the presentation of the seam strength model and the phenomenon of seam-pucker as the interaction of fabric mechanics, sewing machine, and sewing thread in the stitch formation process.

This book is intended as a valuable reference for a wide range of readers, including students, researchers, and academics, as well as manufacturing and production engineers, designers, and researchers working in the field of clothing design, engineering, and other aspects of clothing production. It also provides a basis for researchers working to advance the development of new methods and techniques, creating new scenarios for the future.

The future will bring challenges and drive automation. In doing so, we must be aware that the multitude of emerging technologies, such as computer-aided design (CAD), 3-D body scanning, 3-D virtual garment design, 3-D digital fitting and simulation of virtual garments, and their use in digital fashion, on the field of the 3-D virtual reconstruction of garment heritage, and virtual replicas of historical costumes require advanced skills and trained personnel capable of creating new scenarios to support the future of digital fashion.

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Jelka Geršak

Covers design of traditional and advanced clothing manufacturing processes, from foundational theory and definitions to technical standards and formulae

This second edition of *Design of Clothing Manufacturing Processes* provides a comprehensive overview of clothing manufacturing process design and planning, beginning with clothing classification systems and market segmentation, clothing sizing systems, and key issues in developing a fashion collection. Special emphasis is placed on production planning and control, with detailed coverage of clothing design planning, pattern making and cutting, joining techniques, work analysis, clothing manufacturing planning, the quality requirement for clothing materials, and seam performance.

With its descriptions of the rapid, integrated, and flexible manufacturing systems of today, driven by demand information, this book explains how new supply chain models and manufacturing processes can lead to a much quicker route from design to distribution. This new edition is updated with important new research and topics, including digital fashion and the performance of seams as an important criterion for the quality and appearance of clothing.

Key Features:

- Considers in detail the design of clothing classification and sizing systems
- Comprehensively presents the requirements of digital fashion, the terminology used for virtual garment, fabric modelling for virtual clothing simulation, and digital fitting
- Discusses the planning required in all aspects of clothing production from design and pattern making to manufacture
- Provides a thorough review and description of quality requirements for clothing materials
- Looks in detail at the performance of stitched seams, from the theoretical basis for determining seam strength, the parameters that affect seam strength, to the phenomenon of seam pucker

About the Author:

Dr Sc. Jelka Geršak is Professor of Clothing science and Head of Research and Innovation Centre for Design and Clothing Science at the Faculty of Mechanical Engineering, University of Maribor. She has extensive experience in clothing science related to the design of clothing manufacturing processes, the mechanics of fabrics and the behaviour of textile structures, the objective evaluation of clothing appearance, the physiology of clothing, and wear comfort. Her research focuses on clothing science and human thermal physiology based on the study of complex aspects of the clothing system, textile structure performance and comfort, and more recently smart clothing. She is internationally renowned for her wide-ranging research in the field of textile materials and clothing science.



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