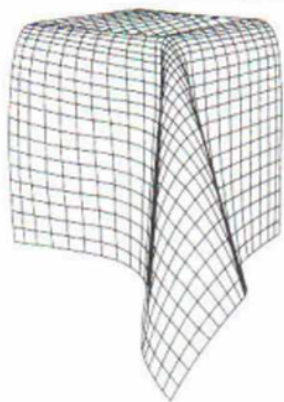


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Structure and mechanics of woven fabrics

Jinlian HU



The Textile Institute

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Contents

	<i>Preface</i>	ix
	<i>Acknowledgements</i>	xi
1	Introduction	1
1.1	Role of woven fabric mechanics	1
1.2	General features of woven fabric mechanical behaviour	2
1.3	Study of woven fabric mechanics	7
1.4	References	18
2	Objective measurement technology of woven fabrics	21
2.1	Significance of Fabric Objective Measurement technology	21
2.2	Mechanical properties measurement	23
2.3	Geometrical and surface properties measurement	34
2.4	Complex deformation measurement	54
2.5	References	58
3	Structural properties of fabric	61
3.1	Theories of woven fabric structure	61
3.2	Structural parameters of woven fabrics	66
3.3	Twist redistribution of folded yarns in woven fabrics	69
3.4	Relationship between fabric structure and surface properties	72
3.5	Relationship between compression behaviour and fabric structure	82
3.6	References	89
4	The tensile properties of woven fabrics	91
4.1	General tensile behaviour of woven fabrics	91
4.2	Modelling of tensile behaviour of woven fabrics	94

4.3	Anisotropy of woven fabric tensile properties	101
4.4	Strain-hardening of warp yarns in woven fabrics	112
4.5	Summary	119
4.6	References	121
5	The bending properties of woven fabrics	123
5.1	General bending behaviour of woven fabrics	123
5.2	Modelling the bending behaviour of woven fabrics	126
5.3	Modelling the bending properties of woven fabrics using viscoelasticity	129
5.4	Modelling the wrinkling properties with viscoelasticity theory	134
5.5	Anisotropy of woven fabric bending properties	137
5.6	Summary	147
5.7	References	148
6	The shear properties of woven fabrics	151
6.1	General shearing behaviour of woven fabrics	151
6.2	Modelling of shearing behaviour of woven fabrics	153
6.3	Testing of shear properties	159
6.4	Shear properties of woven fabrics in various directions	177
6.5	Summary	183
6.6	References	184
7	Fabric complex deformation analysis and simulation	187
7.1	Introduction	187
7.2	Drape categories and fabric cantilever	188
7.3	Modelling of fabric drape profile	198
7.4	References	207
8	Mechanical properties of fabrics with seams	210
8.1	Introduction	210
8.2	Effect of seams on fabric bending/drape properties	210
8.3	Effect of two-dimensional seams on fabric bending/drape properties – horizontal seams	213
8.4	Effect of two-dimensional seams on fabric bending/drape properties – vertical seams	223
8.5	Effect of three-dimensional seams on fabric bending/drape properties	231

8.6	Summary	238
8.7	References	239
9	Modelling drape deformation of woven fabrics and garments – theory	240
9.1	Introduction	240
9.2	Finite-volume formulation	243
9.3	References	262
10	Modelling drape deformation of woven fabrics and garments – computation and simulation	265
10.1	Introduction	265
10.2	Computation	265
10.3	Two-dimensional drape simulations	267
10.4	Three-dimensional drape simulations	270
10.5	Fabric buckling simulation	274
10.6	Circular fabric sheets over circular pedestals	276
10.7	Contact drape simulation of woven fabrics and garments	283
10.8	Three-dimensional skirt simulation by using B-spline surface	294
10.9	References	302
	<i>Index</i>	305

This book introduces fundamental and advanced fabric structure and mechanics. There are 10 chapters covering the general features of textile structure and mechanics. All the simple modes of deformation such as tensile, bending, shear and compression, and the complex, particularly drape deformation of fabrics (mainly woven), are discussed. Testing methods for the objective/instrumental measurement of fabric mechanical properties and structure parameters are also included.

I am grateful to my PhD supervisor, Dr Alan Newton, in the Textile Department of UMIST. He introduced me to fabric structure and mechanics and, through his extensive academic knowledge in this area, taught me the fascinating science of fibre assemblies.

From my own point of view, mechanics is the most difficult science. I achieved lower marks in this subject than in the other subjects I studied as a bachelor degree student. Fabric mechanics must be the most difficult of all areas of mechanics because all my predecessors and the people I have worked with have said so. It is funny to think that I have picked this area for my research. It is also a very rewarding area to work in for the following reasons:

1. I have benefited from the academic standards and professionalism of many outstanding people: Prof. John Hearle, Prof. Ron Postle, Prof. Ning Pan, Prof. George Stylios, Prof. Tongxi Yu and many more.
2. I have become more versatile and have been able to handle other areas of research much more easily because of my understanding and experience in fabric mechanics. This is because the challenges in this field have helped me to solve problems in other areas such as Shape Memory Materials and Textiles more conveniently and quickly.
3. I have made many friends by carrying out different projects and working with different people from all over the world, from India to Europe, from east to west, from students to outstanding scholars, from Hong Kong and China, and across various disciplines ranging from physics, mechanics, civil and structural mechanics, textiles and clothing, medicine, etc.
4. I feel I am a scientist rather than a textile technologist, and thus have no

psychological barriers in regards to working with people from different disciplines, such as chemistry and physics. This has helped me to open new research areas the past few years.

5. Fabric mechanics has become one of the most popular subjects for research students in the Institute of Textiles and Clothing in the Hong Kong Polytechnic University. This is evidenced by the fact that students continue to select this subject; I offer it every semester to different students.

Indeed, as I tell my students, mechanics is closely related to forces. Can anybody tell me what materials or products are used without applying a force? It is difficult to find any. Every researcher should know some basic facts about mechanics; every research student in clothing and textiles should know something about textile/fabric mechanics. Not only that, textiles have been used for many, many areas because of their unique characteristics, as introduced in Chapter 1. To apply textiles to these areas properly and optimally, an understanding of the structures and mechanics of fabrics is required. This book can be used by people working in many areas, including textile composites, geotextiles, medical textiles, transportation textiles, etc.

Thus, I hope this book will be useful for many people and benefit many sectors of scientific and technological development. In particular, people working in the areas of textiles, clothing, materials, fibrous composites and medical textiles will find this book useful as a reference and/or textbook for studying, research and teaching.

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- Dr Fengjun Shi, who worked with me for about one year – his modelling of bending and wrinkling using viscoelastic properties is included in Chapter 5.

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