



纺织高等教育“十一五”部委级规划教材  
纺织工程专业双语教材

# Introduction to Textiles

## 纺织导论

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中国纺织出版社

## 出版者的话

全面推进素质教育,着力培养基础扎实、知识面宽、能力强、素质高的人才,已成为当今本科教育的主题。教材建设作为教学的重要组成部分,如何适应新形势下我国教学改革要求,与时俱进,编写出高质量的教材,在人才培养中发挥作用,成为院校和出版人共同努力的目标。2005年1月,教育部颁发了教高[2005]1号文件“教育部关于印发《关于进一步加强高等学校本科教学工作的若干意见》”(以下简称《意见》),明确指出我国本科教学工作要着眼于国家现代化建设和人的全面发展需要,着力提高学生的学习能力、实践能力和创新能力。《意见》提出要推进课程改革,不断优化学科专业结构,加强新设置专业建设和管理,把拓宽专业口径与灵活设置专业方向有机结合。要继续推进课程体系、教学内容、教学方法和手段的改革,构建新的课程结构,加大选修课程开设比例,积极推进弹性学习制度建设。要切实改变课堂讲授所占学时过多的状况,为学生提供更多的自主学习的时间和空间。大力加强实践教学,切实提高大学生的实践能力。区别不同学科对实践教学的要求,合理制定实践教学方案,完善实践教学体系。《意见》强调要加强教材建设,大力锤炼精品教材,并把精品教材作为教材选用的主要目标。对发展迅速和应用性强的课程,要不断更新教材内容,积极开发新教材,并使高质量的新版教材成为教材选用的主体。

随着《意见》出台,教育部组织制订了普通高等教育“十一五”国家级教材规划,并于2006年8月10日正式下发了教材规划,确定了9716种“十一五”国家级教材规划选题,我社共有103种教材被纳入国家级教材规划。在此基础上,中国纺织服装教育学会与我社共同组织各院校制订出“十一五”部委级教材规划。为在“十一五”期间切实做好国家级及部委级本科教材的出版工作,我社主动进行了教材创新型模式的深入策划,力求使教材出版与教学改革和课程建设发展相适应,充分体现教材的适用性、科学性、系统性和新颖性,使教材内容具有以下三个特点:

(1)围绕一个核心——育人目标。根据教育规律和课程设置特点,从提高学生分析问题、解决问题的能力入手,教材附有课程设置指导,并于章首介绍

本章知识点、重点、难点及专业技能,增加相关学科的最新研究理论、研究热点或历史背景,章后附形式多样的思考题等,提高教材的可读性,增加学生学习兴趣和自学能力,提升学生科技素养和人文素养。

(2)突出一个环节——实践环节。教材出版突出应用性学科的特点,注重理论与生产实践的结合,有针对性地设置教材内容,增加实践、实验内容。

(3)实现一个立体——多媒体教材资源包。充分利用现代教育技术手段,将授课知识点制作成教学课件,以直观的形式、丰富的表达充分展现教学内容。

教材出版是教育发展中的重要组成部分,为出版高质量的教材,出版社严格甄选作者,组织专家评审,并对出版全过程进行过程跟踪,及时了解教材编写进度、编写质量,力求做到作者权威,编辑专业,审读严格,精品出版。我们愿与院校一起,共同探讨、完善教材出版,不断推出精品教材,以适应我国高等教育的发展要求。

中国纺织出版社  
教材出版中心

## 前 言

《纺织导论》是为双语教学编写的,介绍了纺织领域的基础知识和最新进展,内容涵盖纺织纤维、纱线、织物成形、织物染整、纺织品测试与保养等方面的基本知识和原理以及各道加工制品的基本性能和总体发展趋向。读者可从中全面了解纺织这一富有活力的综合性行业。

本教材主要参考了美国及英国原版纺织教科书的内容(见参考文献),章节的编排按照纺织品的加工顺序展开,并结合编者多年的教学经验,同时兼顾学生的学习兴趣。

全书由九章构成:第一章介绍纺织工业、纺织教育方面的知识;第二章讨论常用天然纤维和化学纤维的生产加工、形态结构与主要性能;第三章介绍短纤维环锭纺纱工艺、新型纺纱方法、长丝纱的加工、纱线的类别和基本品质指标;第四到第七章涉及织物的成形加工,详细说明机织、针织、非织造三种成形工艺与设备以及三种织物的组织结构与形态,并简述织物的其他成形方法,如编织、钩织、簇绒和层压法等;第八章简要阐述纺织品前处理、染色、印花和整理的基本原理、加工方法和工艺,并介绍常用的染料。第九章包含纺织品常规测试指标、测试方法和纺织品保养方法及使用须知等。

《纺织导论》是纺织专业的入门课程,开始学习时读者并不需要具备纺织背景知识。为此,书中对技术术语和专业词汇的解释力求清楚,简明易懂;对有关的工艺理论、概念和方法的说明也力求深入浅出、结合实际,便于阅读理解。本书的编写特色如下:

(1)图文并茂。说明性的图表使复杂的工艺清楚易懂,有助于读者加深理解。归纳性的图表对所列各项内容的比较,有利于读者快速地把握主要知识点。

(2)前后文呼应。章节内容的编排兼顾了本书既作为教科书,又作为参考资料的需求。尽管各个专题相互独立,但前后文呼应、脉络清晰,使读者能获得更有条理的专业信息。

(3)章后有思考题和实训题。思考题供课堂学习讨论和复习,实训题为建议学生进行的课外活动内容。两者均联系实际,加深读者对本书内容的

理解。

(4) 专业词汇的中文标注。新出现的专业词汇、术语有中文注释,使读者能快速理解其在课文中的含义。

(5) 词汇表。教材附带的光盘中,列出了纺织纤维、纱线和织物(机织、针织和非织造)及工艺和相关制品的词汇,并选择了部分正文中出现的生词,对其基本含义做了解释。

(6) 多媒体教学。本书附带光盘,光盘中包含两个附录和纺织词汇表以及正文中基础内容的多媒体教材,由 Mr. David J. Hogness(美国)朗读配音。

本教材由顾平主编。其中:第一章、第四章和第七章由顾平编写,第二章和第九章由杨旭红编写,第三章由马建兴编写,第五章由林红编写,第六章由王家俊编写,第八章由邢铁玲编写。编者除浙江理工大学的王家俊外,其他均来自苏州大学。全书最后由顾平统稿,天津工业大学黄故主审。

欢迎广大读者对本书提出宝贵意见和建议。

编者

2008 年 8 月



## 课程设置指导

**本课程设置意义** 《纺织导论》作为纺织工程、针织、纺织材料与纺织品设计、非织造材料和工程、服装、染整等专业的专业课程,囊括了从纺织纤维、纱线、坯织物到成品织物以及纺织品测试与保养等基本知识、基本工艺原理以及各道加工制品的基本性能和总体发展趋向。《纺织导论》课程在大学一年级开设,目的是使学生刚入学就能比较系统地了解纺织概况,明确纺织专业生产与纺织品开发对从业者知识结构、技能的要求,积极主动地学习大学阶段设置的各门基础课程和专业课程。《纺织导论》采用双语教学,对提高学生纺织专业英语的阅读与理解能力,积极高效地阅读国外纺织文献、开阔视野、拓宽知识面都有帮助,可为日后专业课的学习打下良好的英文基础。

**本课程教学建议** 《纺织导论》课程作为纺织工程(包括针织、纺织材料与纺织品设计、非织造材料)等专业课,建议理论授课45课时,每课时讲授字数控制在4000字以内,教学内容包括本书的全部或80%内容。

服装、染整等专业可作为选修课程,建议理论授课36课时,每课时讲授字数控制在4000字以内,选择与专业有关的内容讲授。

**本课程教学目的** 通过本课程的学习,学生应掌握常用纺织纤维的生产、形态与性能,短纤维环锭纺纱的工艺原理、新型纺纱方法、纱线的类别和基本品质指标,机织物、针织物、非织造布及其他织物的成形方法、织物组织、结构和形态,纺织品前处理、染色、印花和整理加工的基本原理、加工方法和工艺,纺织品常规测试指标、方法和保养要求等基本知识,为学习后续专业主干课程起引导作用;同时为学生掌握相应的纺织英语词汇、熟悉专业语言的英语表述方法、顺畅阅读和正确翻译专业文献奠定坚实基础。

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# Chapter 1 General Introduction

## 绪论

Textiles have such an important bearing on our daily lives that everyone needs to know something about them. From earliest times, people have used textiles of various types for covering, warmth, personal adornment, and even to display personal wealth. Today, textiles are still used for these purposes and everyone is an ultimate consumer. Included among consumers are merchandisers of many types, from the wholesale textile manufacturer and merchant to the sales force in any retail-store. Many industries, such as the automobile industry, are important consumers of textiles in various forms. Some other consumers are homemakers, dressmakers, interior decorators, and retail-store customers, as well as students who are studying for these and various other occupations and professions in which knowledge of textiles is of major importance.

装饰品

消费者/商品

批发商/商人/零售店

The merchant, particularly, and all those engaged in the purchase and/or sale of goods must be thoroughly familiar with the merchandise they are handling if they wish to be successful. In fact, the only way to achieve this ability is through knowledgeable awareness of technical data and an understanding of how to use these data. Knowledge of chemical, physical, and microbiological properties of fibers and of the behavior that results from techniques used in creating fabrics guides the consumer in making wise selections when purchasing textile products. Knowledge of proper maintenance techniques for the many fibers, fabrics, and finishes helps ensure satisfaction after purchase. These are the areas of knowledge that this book explores. This book, then, attempts to provide key ideas and facts that will help readers become truly informed consumers. These facts form the basis for the study of textile science.

保养

购买

## 1.1 Introduction

引言

### 1.1.1 Reasons for Studying Textiles

学习纺织品的原因

Textile science covers a large area. To begin with, the word textile comes from the Latin *textilis*, “woven”, which in turn comes from the Latin verb *texere*, “to weave”. In textile science, however, a textile is freely defined as any product made from fibers; thus the term refers not only to woven fabrics, but also to knitted fabrics, nonwoven fabrics, and special fabric constructions. The term textile fiber refers to any product capable of being woven or otherwise made into fabrics. These

机织物/针织物

非织造布/纺织纤维

## 2 Introduction to Textiles

broad reciprocal definitions are now accepted and used by nearly everyone who works with fibers or fabrics at any stage of manufacture or processing.

衣服/家具装饰  
家用纺织品  
过滤布  
Textile fibers and the fabrics made from them have almost limitless uses, and new applications are constantly being found. The uses of fibers in clothing, home furnishings, and household textiles are familiar to everyone. But fibers are also used in the building trades and as insulation in appliances; they are used by industry for such products as filter cloths, pulley belts, and conveyor belts; they are used in all forms of transportation, including space exploration. In fact, fibers play their essential roles in nearly every type of activity or situation conceivable, from playing in the sand to walking on the moon.

There is a logical development of raw material into finished consumers' goods. Studying textile materials in the interesting sequence of "fiber to yarn to fabric" will help you understand the construction and ultimate qualities of the fabrics with which you will become familiar. Here are the steps in the manufacture of fabrics from raw material to finished goods:

原材料/成品  
纤维/纺纱/加捻

(1) Fiber – raw material, which is either spun (or twisted) into yarn or else directly compressed into fabric.

纱线

(2) Yarn – arrangement of fibers, which is woven, knitted, or otherwise made into fabric.

织物/整理加工  
消费品

(3) Fabric – arrangement of yarns or fibers, which by various finishing processes becomes finished consumers' goods.

A study of textiles will show, for example, why certain fabrics are more durable and therefore more serviceable for specific purposes. It will explain why certain fabrics make cool wearing apparel as well as give an impression of coolness when used as decoration. The matter of cleanliness and maintenance must also be estimated before purchasing, when that is an important factor.

品牌  
Complete knowledge of textiles will facilitate an intelligent appraisal of standards and brands of merchandise and will develop the ability to distinguish quality in fabrics and, in turn, to appreciate the proper uses for the different qualities. As a result, both the consumer merchant and customer will know how to buy and what to buy, and salespeople will know how to render good service to those consumers who have not had the advantage of a formal course in textiles.

混纺  
注册商标  
Great strides have been made in the textile industry, and have markedly influenced our general economic growth. The prosperity and growth of related industries, such as petroleum and chemistry, and dependent industries, such as retail apparel stores, have produced broader employment opportunities. Competition for the consumer's dollar has fostered the creation of new textile fibers with specific qualities to compete with well-established fibers. New fiber blends have been created to combine many of these qualities into new types of yarns with new trade-marks. There are also new names for the fabrics made of these new fibers and yarns. New finishes have been developed to add new and interesting characteristics to fibers, yarns, and fabrics.

This welter of creativity and the myriad of trademarks present a challenge to the consumer, who is sometimes knowledgeable but frequently confused. Without being overly technical, this information can be easily understood and consequently



very useful to the consumer in business and personal life. All of this information can be adopted for such utilitarian benefits as economy, durability, serviceability, and comfort, as well as for such aesthetic values as hand (or feel), texture, design and color.

手感/质地/花型

In the study of textiles, the students' initial interest will become an absorbing interest when they discover the natural fascination of fabrics and their cultural associations, particularly when factual study is supplemented by actual handling of the textile materials. The subject will seem worthwhile as they become familiar with illustrative specimens and fabrics and begin to handle and learn to compare the raw materials of which fabrics are made as well as the finished consumers' goods.

样品

### 1.1.2 Ranges and Markets of Textile Industry

纺织工业的领域  
与市场

The textile industry is very complex. At this point, only an introduction can be given so as to provide a brief overview for some insight. It begins in agriculture with fiber production of cotton, flax, and other fibrous plants; in husbandry of sheep, other animals and silkworms; in mining of metals and minerals; in forestry for wood; in chemical research and production of synthetics. These fibers may be short or long, fine or coarse, soft or stiff, smooth or rough, and are processed into yarns and/or fabrics. Usually, however, the fibers are initially formed into yarns. These yarns may be simple or complex, single or ply, smooth or rough, highly twisted or loosely twisted. The yarns are then made into fabrics by various methods, such as weaving, knitting, nonwoven processing, braiding, or knotting.

棉/亚麻/牧羊业  
蚕

强捻  
弱捻  
编织/打结, 结网  
湿加工  
外观  
终端产品/服装  
工业用途

Selected finishing or "wet-processing" procedures, the fabrics are converted into finished cloths, which provide particular appearances and performances. These fabrics are made into end-use products, including apparel, home furnishings, and various industrial applications. These products are then merchandised and sold. Every one of these aspects of the textile industry is a field in itself, and there is an interdependency with multiplying effects on other industries.

As one learns about the various aspects of the production of textiles and textile products, it becomes apparent that these activities play a major role in the economy. The industry has so many facets that it is possible that the student's interests may develop in the pursuit of a career in one of them. For example, consumers require the services of teachers of textiles, home economics, and interior decoration.

室内装潢

Opportunities for careers in textiles are almost endless in variety. The industry involves fiber producers—growers or manufacturers; fabric manufacturers; converters—those who finish and color fabrics; designers—those who design yarns and fabrics; marketing specialists for each of these levels. Moving into the end-use area, there are product designers—those who plan the designs for the use of fabrics in apparel, home furnishings, transportation, industry, etc.; garment manufacturers; domestic manufacturers; industrial fabric manufacturers; product manufacturers for all of these end-uses; marketing specialists for the wholesale trades; marketing organizations for the retail trade, and all others involved in the transfer of the textile fiber through all of the various stages to the final consumer.

服装