

**Academic Plan
2009-2014**

Textiles and Clothing

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Academic Philosophy and Vision

We envision the Division of Textiles and Clothing as the premier, global generator and disseminator of knowledge in the development and acceptance of novel and sustainable fibrous materials that promote benefits for human health, performance, protection, safety, and well-being. In particular, we are interested in pursuing new physical and social science approaches toward the development of biobased materials that address natural resource issues (i.e., beyond a reliance on fossil fuels); human concerns, on the part of producers and consumers alike; and lifecycle and environmental considerations (i.e., more sustainable processes and products).

We base our vision on the idea that materials matter and change in accordance with production and consumption. It is through their derivation and use that materials acquire meaning and value. Ultimately, the sustainability of agriculture and subsequent processes demands an attention to the interplay between material properties and consumer usage. We take this interplay seriously; it relies upon a fundamental connection between the physical and social sciences, in order for material properties to be culturally, economically, environmentally, and functionally relevant to changing human needs.

Academic Mission

Our academic mission derives from being located in California, the second largest fiber/textile/apparel producing state in the nation. This academic mission is to develop, integrate and disseminate knowledge in the physical and social science aspects of sustainable production and consumption of fibrous and biobased materials and products. Our disciplinary leadership lies not only in the fundamental physical and social sciences, but also in their integration, enabling us to address basic questions and, at the same time, complex issues related to fibrous materials for human protection and public health as well as environmental sustainability. Our research and educational programs, in their focus on fibrous materials, are unique to the U.C. system and make significant contributions to California's competitive position in fibrous materials and biobased products. Our AES projects address material and consumer issues such as human safety, comfort, and the role of cultural diversity in consumer decision making while providing the critical knowledge base to occupational groups such as firefighters, first responders, emergency personnel and the military. We actively seek collaborations with colleagues on and off campus and outreach to private and public organizations in the state and nationally as well as internationally.

Program Characteristics, Opportunities, and Challenges

Strengths and Distinctive Characteristics

Our continuum from behavioral science to physical science distinguishes our academic leadership in the continuing development of education and research programs (**I&R**) to address complex issues related to fibrous materials and products to benefit humans and the environment. The disciplinary expertise of our faculty allows the offerings of two quality interdisciplinary undergraduate majors, one in Fiber and Polymer Science and the other in Textiles and Clothing. At the graduate level, faculty are actively involved in several graduate programs including Agricultural and Environmental Chemistry, Biological and Agricultural Engineering, Chemical Engineering and Materials Science, Cultural Studies, Forensic Science, and Textiles. Our faculty is nationally and internationally recognized for their research in fibrous and biomaterials, consumer perception and behavior, functional clothing for personal protection and sustainable textiles. Our research in these areas has been funded by the National Science Foundation, the National Textile Center and commodity (e.g., cotton, dairy) groups

Our multidisciplinary expertise and emphasis on the interface between the physical and social sciences also allows us to address many Agricultural Experiment Station (**AES**) issues on the improvement of material properties, impact of the materials and processes on humans and the environment and the ultimate consumer/user acceptance of the products. All our faculty actively participate in outreach activities related to their areas of expertise. Through our Hatch and Multi-State AES projects as well as extramurally funded research, we make connections with diverse industry sectors, state and federal government agencies, and non-profit organizations as well as consumers. Our industry partners include those in the cotton and manufactured fiber industries, the apparel industry, paper and forest products, the consumer product sectors, and medical and industrial products. The addition of Cooperative Extension (**CE**) Specialists in these areas would enable systematic coordination and more extensive outreach in all programmatic areas.

Collaborative Opportunities

There are a variety of areas that connect us to other units within the college and across campus including: cotton fiber quality, biobased materials and biofuels, functional fibrous products for human health and safety, and consumer perceptions and behavior. Collaborations established thus far have generated new strategies for and solutions to emerging issues. For example, a collaboration with Biological and Agricultural Engineering addressed salinity problems in agricultural production in the San Joaquin Valley. As a result, drainage salts are being recovered and used as a resource material for textile processing in a Los Angeles dyehouse. In a dairy industry funded project with Food Science and Technology and Chemistry, new high-value added smart polymers (e.g., drug delivery, stimuli-responsive) and biobased commodity polymers (adhesives, coatings, foams) have been synthesized from lactose, the under-utilized by-product of whey. We continue to build synergism in the areas of biobased materials and chemicals with Biological and Agricultural Engineering, Food Science and Technology, Chemistry, Chemical Engineering and Material Science and Plant Science; we cooperate on projects involving functional fibrous products for human health and safety with Environmental

Toxicology, Entomology, and Medicine. Currently, an interdepartmental group of faculty is exploring an environmental and human health theme as an integrating core that weaves together all three major components in the college: sustainable agriculture, environmental protection, and human health. How the three components benefit the people of California is manifested by effectively providing consumer products that are beneficial to human health and friendly to the environment.

Quality and Impact

Our faculty are held in high regard by our peers as demonstrated by the important roles our faculty play in their respective fields and professions and the awards received (Appendix IV.c). We have disseminated research findings in some of the most highly regarded journals. In the physical science areas, these include the Cellulose, Journal of Polymer Science, Journal of Materials Science, Journal of Agricultural and Food Chemistry, Macromolecule, Materials Chemistry, Materials Science Letters, Nanotechnology, Physical Review E., Polymer, Textile Research Journal, Tran. ASME, and Tran. Royal Society of London. In the social science areas, these journals include Clothing and Textiles Research Journal, Symbolic Interaction, Journal of Consumer Culture, Journal of Retailing and Consumer Services, and Visual Sociology. From 2000 to 2007, the current five faculty members have generated 273 peer reviewed research publications, in addition to many more invited conference papers, presentations, and reports. Thirteen US and international patents were granted.

Our faculty has been very competitive in acquiring extramural grants totaling \$6,809,164 from 2000 to 2007 (Appendix IV.b). Major sources of funding include the California Department of Forestry and Fire Protection, the California Dairy Research Foundation, Cotton, Inc., the National Science Foundation and the National Textile Center. From 2000 to 2007, 22 M.S. students and 26 Ph.D. students completed their degrees with the current faculty.

Challenges and Priorities

Our main challenge is to maintain the critical faculty expertise and to advance our academic leadership in the sustainable and biobased materials and transnational production and consumption areas. Considering the demographics of our current faculty, anticipated retirement and the necessary critical mass to deliver quality education, research and outreach programs, our top priority is to build critical mass of faculty to advance scholarship in our core and new areas synergistically.

As noted in the most recent reviews of our undergraduate programs (2005-07) and graduate program (2003), we have serious facility needs. The most critical needs in our chemical laboratories are additional and modern chemical fume hoods, additional bench space, and chemical-free space for students and teaching assistants. We continue to seek and obtain Instructional Equipment Replacement funds to upgrade instruments for our teaching laboratories. The expenses to maintain and upgrade existing facilities and equipment have increased significantly in recent years. Often, the in-kind donations of equipment by our industry contacts to expand our material processing and characterization capability cannot be realized due to the limitation in space, both quality and quantity.

Research, Outreach and Extension: Priorities

Our fundamental research supports California's leading national and global role in fiber and apparel production and improves the well-being of Californians. Our research on sustainable materials and production, product quality and analysis of emerging consumer cultures benefits the apparel industry, while our research on quality/product evaluation, material/process innovation and sustainable resource development advances the fiber (e.g., cotton), textile, consumer product, and other affiliated industries.

Cutting edge materials research includes ultra-high specific surface fibrous materials, nano-porous fibers, nano-tube assemblies, antimicrobial finishing, and textile dyeing with nano-particles. In researching new materials and processes, emphasis is given to understanding and to minimizing the environmental impact of initial resources (e.g., reducing the reliance on petroleum-based resources) and that of the entire life cycle of fibrous products. This research is complemented and integrated with social science studies on the meanings and motivations associated with human choices that shape the need for distinct material properties.

In multiple academic planning sessions, we have identified the following as our academic and programmatic priorities:

Biobased Materials, Sustainable Products and Green Chemistry

Our current reliance on fossil fuels (petroleum and gases) for energy and materials cannot be sustained. The United States has set the ambitious goal of deriving at least 25% of its chemicals and materials from biobased sources by 2030. The California Biomass Collaborative (2005) estimates that 30 to 40 percent of the 100 million tons of biomass produced in the state could be utilized to produce renewable electricity, fuels, and biobased materials and products such as fibers, films, plastics, coatings, inks, composites, cleaners, solvents and lubricants. UC Davis is well positioned to become a center of excellence in the area of biobased materials and chemical feedstocks. Our vision for a center of excellence in *Biobased Materials and Green Products for Health, the Environment, and Culture* is detailed in Appendix III.

Our faculty has physical science expertise in the areas of chemistry, physics and engineering processing of organic materials, especially fibers, polymers and fibrous products. The Division, a long-time champion for educational and research programs related to natural materials and biopolymers, is committed to support and expand the fundamental inquiries to discover and develop new chemical feedstock, materials and precursors to products (and fuels) from biological resources. *We are in an excellent position to provide the intellectual coherence, scientific expertise, academic programs and research facility to this and other future FTEs (I&R, OR and CE) in the areas of biobased materials, sustainable products and green chemistry.*

Investment in these areas would expand our ability to be at the forefront and interfaces of the physical, biological, and social science dimensions of materials: their derivation from renewable resources, the enhancement of their properties, and their functionality and acceptability. Our faculty has taken the lead in coordinating efforts to bring together programmatic interest in the area of biobased materials and products since 2004. In collaboration with the California Institute

of Food and Agricultural Research (CIFAR), we led an interdisciplinary effort, supported by the College of Agricultural and Environmental Sciences and involving faculty from Biological and Agricultural Engineering (BAE), Chemical Engineering and Materials Science (ChMS), Food Science and Technology (FST) and Textiles and Clothing (TXC), to bring a number of national and international experts on biobased materials and processes to campus to represent academic and governmental as well as industrial perspectives. We collaborated with Plant Science in a second biobased fuel and products seminar in 2005. Currently, we are hosting yet a third seminar series on "sustainable materials for human and environmental health" in collaboration with the Departments of Environmental Toxicology and Entomology. Our students continue to benefit from exposure to this timely and critical topic.

The current undergraduate and graduate curriculum in fiber and polymer science has included content on biobased fibrous materials. In Spring 2008, we offer a new undergraduate seminar on product innovation and sustainability (FPS/TXC 98/198). With added FTEs and collaboration with other programs in the CA&ES and across campus, it is envisioned that this biobased content may be expanded further in existing courses and also allow us to develop new courses that are entirely devoted to biobased materials and green chemistry. Curricula related to biobased materials, sustainable products and green chemistry would serve students in the CA&ES and throughout the campus by preparing them for leading industrial sectors in California, including agricultural, apparel, food, pharmaceuticals, industrial and consumer products.

The CE specialist in biobased materials, sustainable products and green chemistry would provide the critical link among fundamental research programs and the vast and diverse agricultural industries, manufacturing and product industries and environmental groups in California. The specialist will lead and coordinate efforts to determine top statewide needs and establish effective and meaningful connections, starting with: 1) CE specialists in major commodity areas including cotton, food, wine and other agricultural products; 2) faculty and researchers who have close links with the various sectors already; 3) alumni who are working in the related private and public sectors; and 4) National Textile Center projects and industry sponsors.

Human and Environmental Health

Emerging infectious diseases, environmental contamination, and pesticide/toxic chemical poisoning, as well as potential terrorist attacks, represent threats to human and environmental health. To prepare for any emergency and protect human health, we need to have increased attention to protective clothing materials and to the development of novel functional textiles since clothing is the second skin to the human body. Globally, functional and human protective materials are a current foci of research and development of textile materials. These materials can contribute significantly to human health and well being. Increased funding and funding opportunities are currently available from several federal agencies, including the NSF Biocomplexity program, the NIH and CDC/NIOSH environmental and human health programs, the NIOSH and DHS personal protection program, and various DOE and EPA programs.

The CA&ES already has many relevant teaching and research programs pertaining to agricultural products, environmental hazards, biomaterials, and human health, and is internationally recognized as a leader in the area of agriculture and human health. The Division of Textiles and

Clothing is a national leader of research on protective clothing, particularly in the areas of biological and chemical protective textiles. So far, several technologies developed by our faculty have been commercialized. Our faculty are currently working on a multidisciplinary study on reusable and disposable medical textiles, supported by the National Science Foundation (NSF), and are establishing a national network of protective clothing research, supported by the National Textile Center (NTC). Several members have studied wildland firefighters' uniforms for the California Department of Forestry (CalFire) and have participated in a regional research group on protective clothing. All faculty members are committed to teaching and research activities in this very active area. In addition, an upper division course on protective clothing materials (TXC 171), is offered to graduating textile seniors.

More recently, environmental and human safety consequences of functional textile products have been the focus of several new initiatives in California (2008) and UC (2006). Human errors and consequences have taught us to more carefully and thoroughly evaluate any product from broadened multidisciplinary directions, including material chemistry, manufacturing and processing, human and environmental biology and chemistry, social and public health, and policy and public education. Working with colleagues in the Departments of Environmental Toxicology and Entomology, our faculty have taken the lead to organize a new seminar series "Sustainable Materials for Human and Environmental Health."

The CE specialist in this area will be devoted to dissemination of the latest information about fibrous materials and functional modifications for protecting humans and the environment. Examples include pesticide and healthcare protective clothing, safety of consumer products such as the use and environmental consequences of functional finishes for textiles (e.g., flame retardants, water repellents, dyes, etc), and sustainability of materials and products currently in use. By closely collaborating with faculty members in this department and other related programs and conducting research activities, this specialist will bridge the academic discoveries and problems challenging our environment and people. A CE position in this emerging area could take the lead in identifying potential harm to human populations, promoting public awareness of the issues relating to human and environment health and implementing public risk management education.

Transnational Production and Consumption

Materials need to be produced in order to be consumed. And, without a consuming market, there would be no need for material production. The interdependence of production and consumption, however, has been undermined by a global "disconnect" between production issues such as resources and environment (e.g., water, energy, raw materials, chemicals, wastes) and labor (e.g., garment, agricultural, manufacturing), on the one hand, and consumption issue (e.g., identity, perception, cultural meaning), on the other.

Transnational production-consumption studies is a newly emerging field that offers a fresh analytical approach, moving beyond the global "disconnect" between production and consumption. Transnational production-consumption studies re-imagines consumption as more than the end of a pipeline or "value chain." Further, this emerging field re-imagines production as a site of social and environmental responsibility, as well as profitability. It draws on, and

integrates, the existing, currently burgeoning fields of consumer behavior, cultural studies, the sociology of consumption, political economy, cultural theory, and environmental and sustainability studies. Evidence of the vitality of this emerging field is evident in the recent development of journals such as *Consumption, Markets, and Culture* and *Journal of Consumer Culture*, as well as academic and popular attention to garment labor, “green” materials and processes, and other issues linking consumer ideology with the means of production. Transnational production-consumption studies pursues some of the most urgent social, environmental, and ethical issues confronting us today.

Intensifying the need to overcome the global disconnect are major economic and political changes as well as dramatic developments in communication and transportation associated with transnational capitalism. As Thomas Friedman expressed it in his best-selling book on globalization, our modern world is indeed flat; therefore, it is imperative that we gain an understanding of different lifestyles and ways of doing business around the world.

The textiles complex is especially illuminating in this regard; it is tightly linked to global issues for a number of reasons including the facts that:

- Most of the over 200 countries in the world are engaged in some form of international trade in textiles and apparel.
- Less developed countries often view textiles and apparel as a way to generate the economic growth needed to improve quality of life; more developed countries support this growth in the interests of greater peace and stability.
- The textiles complex has one of the most complicated systems of linkages and constraints on trade.

The UC Davis Textiles program is well poised to play a leading role in transnational production-consumption studies, given our historical strength in consumer behavior, coupled with our involvement in the Cultural Studies Ph.D. Graduate Group and the scientific expertise in the CA&ES and on campus that underpins production and the environment. As world markets in textiles and apparel become increasingly intertwined and trade regulations and barriers grow ever more complex, California producers need assistance in taking advantage of global opportunities and avoiding global pitfalls. An outreach program in transnational production and consumption could provide research-based advice on a variety of areas ranging from current economic, social, and political forces affecting global exchanges to practical details on services provided by trade-related organizations and agencies. We anticipate working closely with groups such as the Sacramento Regional Center for International Trade Development to facilitate successful importing and exporting activities. We also envision increased involvement with consumer groups and non-profit organizations addressing issues of labor, sustainability, and global ethics.

Educational Programs and Development

I. Undergraduate Education

Mission

The mission of our undergraduate programs is to build depth and breadth of knowledge related to fibrous and polymer materials and their use as sustainable products in society, to enable graduates to advance in a broad range of careers, to develop problem-solving abilities across disciplinary boundaries and to uphold ethical values.

Core Value

Our undergraduate programs focus on fundamental sciences, their integration with human-environmental considerations and global perspectives. The curricula emphasize basic principles in polymer, fiber and textile materials, their processing, development and quality in consumer and industrial products, their distribution and contribution to quality of life (human health, safety and protection) and their economic and environmental impact. Our faculty continually assess and refine the curriculum to support our leadership role in teaching and research programs along the clothing-fiber-polymer continuum. In fact, our inter-disciplinarity demands such continual assessment and refinement. Given the diverse disciplinary backgrounds of the faculty, we are especially conscious of the need to understand and highlight interconnections and to maintain balance among the physical, social and cultural dimensions of our majors.

Current Curricula

We offer two Bachelor of Science degrees, one in Textiles and Clothing (TXC) and the other in Fiber and Polymer Science (FPS) (Appendix V.a,b). Our undergraduate majors have rigorous preparatory requirements in the sciences as well as those critical to build critical thinking and analytical skills (Appendix V.g). We continue to integrate social and physical science to address issues of product innovation and sustainability. Writing and communication components are integrated in many of our TXC and FPS courses. We pride ourselves in providing extensive experiential learning opportunities via laboratories, discussions, internships and student organization activities (Appendix V.d,e,g). Our graduates have been well placed in the various sectors of the public and private sectors (Appendix V.f).

Curricular Development and Vision

Textile and Clothing (TXC) Major

Building upon our interdisciplinary strengths, we propose some curricular revisions in the coming few years, toward a goal of framing and communicating our major and its scope more clearly for prospective students and stakeholders. We propose to change the name of the major from Textiles and Clothing to Textile and Consumer Studies. (We would maintain the TXC designation.) We believe that the inclusion of “consumer” in the title will highlight the

behavioral, cultural, and economic dimensions of our program and reflect our intention to expand our program on the consumption side of our production-consumption continuum.

For disciplines concerned with modification of structures and properties of products to meet end-user needs, it is critical to understand end users. In appreciation of that fact, courses in Consumer Science have been taught for almost three decades in CA&ES. From 1993 through 1998 and in the summer of 2007, these courses were taught by faculty in the Division of Textiles and Clothing and the program is still housed in our unit. Although taught by our faculty, courses such as CNS 100 served a variety of other majors both within and outside of the college. Teaching of the courses was reduced with great reluctance due to pressure to provide our own students with more discipline-specific classes. Recognizing the problems created by lack of attention to the consumption side of the production-consumption equation, however, we now would like to reconstruct the program.

Overall, the Textile and Consumer Studies major will continue to highlight interdisciplinary and other skill-development strengths. It will emphasize the connections among (a) the physical characteristics of textile products, (b) consumer perceptions of and behavior toward these products, and (c) global economic trends affecting the textile marketplace. The major is based on the premise that an integrative knowledge base is needed to link textile products with social and behavioral processes such as the production, distribution, and consumer use of textiles.

Students will be able to select among three options (Product Development and Evaluation, Marketing/Economics, and Transnational Fashion Studies), depending on their post-graduate academic and career goals.

Fiber & Polymer Science (FPS)

Our current academic planning envisions the FPS major to include two specializations: Biomaterials and Advanced Technology and Engineering. The current FPS curriculum includes some essential biobased fibrous materials content and serves as a foundation for expansion in the biomaterials and advanced materials areas. Specific strategies toward development of these specializations are: 1) expansion of current core courses; 2) reinstating and revision of courses; and 3) development of new courses. The expansion of current core courses can be made possible by re-organizing course offerings, e.g, alternate years, while reinstating inactive courses and offering new courses would need the addition of new I&R FTEs.

The current FPS core consists of three lecture and one laboratory courses: FPS 100, 150, 161 and 161L. FPS 100 involves polymer physics and engineering properties. FPS 161 covers natural (cellulose and proteins), regenerated and synthetic fibers whereas FPS 150 focuses mainly on synthesis and reactions of synthetic polymers. Expansion of these courses would be the logical first step. FPS 100 can be expanded to include biomechanics. FPS 161 can be expanded to include biologically derived precursors to natural fibers and products for fiber modification. FPS 150 can be modified to include macromolecules and natural polymers. With additional FTEs, expansion of both courses into new courses specifically focused on carbohydrate chemistry, macromolecules and by-products would contribute toward the educational aspects of our effort. For instance, the expanded course offerings would allow content on a broad range of

proteinacious materials, other polysaccharides (chitin, starch, pectins), ligno-cellulosic polymers (polyphenols) as well as their derivatives. Each can be expanded into two courses, one emphasizing natural and biobased materials and the other synthesized or integrating them in sequence.

Two courses, i.e., TXC 165 (textile processing) and FPS 110 (plastic materials in society), have not been taught since the loss of two faculty to early retirement in 1994. These courses can be reinstated to emphasize content related to conversion, processing, product development and life cycle analysis of biopolymers and biobased products. TXC 165 can be revised to emphasize green chemistry, bioconversion and the issues related to chemical use in processing. Examples include the use of enzymes in bioprocessing of fibers and textiles and in decoloration of dyes and detoxification of chemicals in industrial waste streams. FPS 110 can be reinstated to stress the utilization of cellulose from a broader range of plants and microbial sources as fibers, the recycling and reuse of rubber, plastics and paper products, as well as the health and environmental impacts of chemicals used in consumer fiber and polymer products.

With new I&R FTE, new courses at the interface of physical and biological sciences could be developed and added to better prepare contemporary materials science students for the 21st century. Topics here can be the utilization of biologically derived compounds for materials (fibers, polymers, adhesives, coating, lubricants, surfactants, etc.) and products (consumer, industrial, medical, civil, architectural, etc.). Another area can be learning from nature and the development of new materials and products through biomimetics.

These expanded FPS curricula would give students in the CA&ES, DBS and Engineering new and contemporary material perspectives and expanded scientific knowledge, and will help to build a solid and comprehensive polymer and material science program that can provide students with multidisciplinary views. The biobased material curricula will better prepare students to be future leaders (educators, scientists, engineers, policy makers, etc) toward a biobased economy. These curricula satisfy the increasing demands of students for programs and courses that meld biology and engineering and produce qualified graduates for the rapidly expanding biomaterials, biologically derived chemical products and bioenergy industries in California and across the nation.

II. Graduate Education

Mission

Graduate education is a vital component of a research university. Our mission is to provide advanced knowledge related to fiber and polymer materials, social, cultural, economical and transnational production and consumption and to educate the next generation of scientists to explore and develop new cutting-edge knowledge and technologies to meet the ever increasing societal demands on fibrous materials in quality, quantity and functionality.

Current Graduate Programs

Our multidisciplinary faculty have joint affiliations in several graduate programs on campus,

including the Textiles Graduate Group, which is hosted in this department, and other M.S. and Ph.D. programs such as Agricultural and Environmental Chemistry, Biological and Agricultural Engineering, Chemical Engineering and Material Science, Cultural Studies, Forensic Science, and the Individual Ph.D. Our graduate students typically work with other faculty and students from a wide range of disciplinary areas and academic culture.

Within the physical science component, there is considerable strength in the study of fibrous and biobased materials, protective clothing against microorganisms, toxic chemicals, heat and flame, chemical modification of polymers, synthesis of functional monomers and preparation of new functional polymers, nano-fiber spinning technology, and utilization of agriculture and textile byproducts and wastes. In the social science component of the program, we have a great deal of expertise in consumer behavior, marketing theory and research, cultural studies of style and fashion, and transnational studies related to consumer preference and globalization.

Curricular Development and Vision

Our faculty offer six graduate courses on a regular basis. TXC 230/298 and FPS 250 A-F teach in-depth materials for social and physical science students, respectively, while TXC 293 serves as a bridge to meet the needs of students in both areas. The curriculum has been evolving as student and faculty research interests have changed. Interests in the areas of cultural studies, global marketing and trade, forensic science and health-related issues are growing among faculty, students and government agencies. Issues of sustainability, human safety and environmental health in relation to all textile products, as well as special needs in personal protection in these times of global terrorism and emphasis on homeland security, are further propelling research and innovation in various fiber and polymer science fields.

TXC 293 has developed into a course focused on interdisciplinary research methodologies and content. This course has been modified to the point that it is considered to be a new core course for the Textiles M.S. and will be given a new course number. The faculty has revised FPS 250 A-B course content to include more information on biobased materials, biomechanics and sustainability of polymer products. A TXC 298 class textile marketing concepts has been revised to include more international and Internet content and is also being considered for a new course number. With additional FTEs and course offerings, we envision providing campus leadership through designated emphases in the areas of sustainable materials and consumer studies.

Enrollment Targets and Graduate Student Support

Our faculty is fully committed to graduate education and has been competitive in securing extramural funds for research and graduate student support. As research activities develop and expand to sustainable materials, human safety and environmental health, transnational production and consumption of fibrous products, we expect that collaborations with a number of academic departments in the college and on campus will increase, thus enhancing our ability to seek large, multi-disciplinary research and training grants to support more graduate students. We expect a moderate growth in graduate student numbers in 2009-2014. However, the non-resident tuition and fees and laboratory space remain to be a major barrier that limit our ability to grow.

Current and Future Positions Needed to Achieve Our Goals

Current FTE

We currently have five Senate faculty for a total of **3.0 I&R** and **2.0 AES**, each with the same 0.6 I&R and 0.4 AES appointment. All five are at Professor rank and over the age of 50. One Senate faculty is expected to retire in 2009. The last two retirements reduced our normative 6.0 FTE to the current five (Appendix IVa,d).

FTE Priorities

Biobased & Sustainable Materials, Green Chemistry (I&R, AES, CE): 3.0 FTE
Transnational Production and Consumption (I&R, AES, CE): 2.0 FTE

2009-10: 1.0 FTE in biobased/sustainable materials, green chemistry: biomaterials and products
1.0 FTE in transnational production and consumption: comparative studies

2010-11: 1.0 FTE in biobased/sustainable materials, green chemistry: human and environmental health

2011-12: 1.0 FTE in biobased/sustainable materials, green chemistry: functional fibrous products

2012-13: 1.0 FTE in transnational production and consumption: behavioral economics

Our academic strength focuses on basic sciences and their interdisciplinary connections. Our undergraduate and graduate curricula have been developed, evaluated and refined according to these principles.

To reach a critical mass for our core programmatic areas and to advance in new directions highlighted in the CA&ES Strategic Plan, 1.0 new I&R and AES FTEs in biobased and sustainable products/green chemistry is needed in addition to the 1.0 FTE for the transnational production and consumption position vacated by the anticipated retirement.

To become an international leader in sustainable materials and consumer studies, additional FTEs are needed. The top priority for the new FTE is in the areas of: (1) biobased/sustainable materials and products; (2) green chemistry for functional fibrous products; (3) sustainable materials for human and environmental health. An additional 2.0 FTE in biobased/sustainable materials, green chemistry and 1.0 FTE in transnational production and consumption would provide the programmatic focus and synergism needed for leading academic programs in the sustainable materials and consumer studies areas. These new FTEs may have similar I&R and AES appointments as the current faculty or a combination of I&R/CE, AES/CE or I&R/AES/CE.

Appendix I.

Academic Philosophy

“The Fibre itself strengthens by use” (Fuller, 1711).

Since at least the seventeenth century, the term “fiber” has been used to characterize physical/biological materials whose strength coincides with use and flexibility. Defined as “threadlike bodies or filaments that enter into the composition...of animal and vegetable tissue” in the seventeenth century, fibers became understood in the nineteenth century as fibrous substances “fit for use in textile fabrics” (*OED*). It was not until 1993 that the *Oxford English Dictionary* added food materials (i.e., dietary fiber) to its repertoire of definitions.

Meanwhile, developments in organic chemistry furthered the field and breadth of fiber science to include synthesized materials, but the original idea that use, or consumption, strengthens these materials has endured. This idea suggests that consumer acceptance is necessary for the very survival of materials; but it goes further. Materials need to be physically useful to address emerging consumer needs, as well as economically feasible and culturally relevant. Material culture, that is, relies upon a critical and creative interface between fibers and the meanings and values that consumers ascribe to them. In other words, materials matter and change in accordance with consumer use.

It is through use that materials acquire their meaning and value. The term “consumption” has traditionally been used in modern western societies to refer to its role as the opposite of production. In recent years, this meaning has broadened and shifted along with globalization and advancements in material development for enhanced functionality (e.g., protection, health, safety, performance) and sustainability (i.e., ongoing economic, environmental, and ethical viability). Increasingly, it has become understood that we need something other than a “disconnect” between production and consumption. We need an interface rather than a separation. Fiber science helps to bring the need for such an interface to the surface, through its focus on material development and properties within a sustainable framework. New theories of consumption, informed in an interdisciplinary way that spans the humanities and sciences, recast a view of goods from “direct objects of utility” toward an understanding in which it is through “properties or characteristics of the goods from which utility is derived” (Lancaster, 2001).

We take the interplay between material properties and consumer usage seriously. Indeed, we submit that the sustainability of agriculture and subsequent processes for consumer products demands an attention to this interplay. Most fundamentally, this sustainability relies upon a connection between the physical and social sciences, so that material properties are culturally, economically, environmentally, and functionally relevant to changing needs for human health, performance, protection, safety, and well-being.

Appendix II. FTE Proposals

FTE Proposal I Biobased Materials, Sustainable Products and Green Chemistry

Toward a Biobased Economy: Materials, Chemicals, Energy and Fuels

This biobased materials FTE request, the first toward building a critical cluster of FTEs in this area, is essential to the establishment of a biobased materials program in CA&ES to parallel the continuing development of a bioenergy focus on campus. The Division of Textiles and Clothing (TXC), a long-time champion for educational and research programs related to natural materials and biopolymers, is in an excellent position to provide the intellectual coherence, scientific expertise, academic programs and research facility to this and other future biobased materials FTEs. The biobased materials FTE focuses on the fundamental inquiries to discover and develop new chemical feedstock, materials and precursors to products (and fuels) from biological resources. The eventual cluster of FTEs will put the TXC program and the CA&ES in the forefront nationally and internationally in the advancement of renewable and sustainable chemical feedstock, materials and products. This academic vision not only connects biological sciences with materials science and processing but also fills the critical societal needs toward a sustainable materials supply chain for the future. The related research areas provide synergistic expertise toward a new center of excellence that coalesces the existing strengths in CA&ES as well as the already in-place recruitments in the area of bioenergy and sustainable development on our campus. In addition, the requested biobased materials CE component offers the critical link for us to the diverse agricultural and environmental sectors in California.

Background Renewable resources from plants, animals and microorganisms have offered a broad range of useful products throughout human history. In the last century, however, the development and share of biobased products in our economy, particularly in consumer and industrial products, were far from being on par with those derived from the fossil fuels. Now with fast depleting fossil fuel and the significant adverse environmental impact on our way of living, it is ever more pressing to make swift transition from fossil fuel-based petrochemical refineries to other more sustainable alternatives such as biorefineries. The future of California's agricultural, chemical and energy industries relies upon a solid knowledge base and pathways to utilize and convert biological resources to chemical feedstock, materials and products. Today, ever-accelerating advances in biology, physical sciences and engineering have allowed better understanding and use of biological systems in ways that were previously unimaginable. Molecular biology and genetic engineering offer new possibilities to utilize plant materials for large-scale production of both known and novel products including fibers, food, polymers, paints, adhesives, lubricants, etc. There are tremendous new possibilities to replace existing and to create new materials with biologically derived renewable feedstock while improving the sustainability of our natural resources as well as our environment. Only through parallel development of renewable biobased materials along with fuels can a true recycling of carbon be achieved.

Existing strengths on Campus and in the College Biobased materials and processes fit within the foundation areas of agricultural systems, natural resources and environmental sustainability.

With established strengths in these areas, the CA&ES is well positioned to lead the effort and a center of excellence in biobased materials. The long-term vision would be an integration of the physical, biological, and social science dimensions of materials focusing on: their derivation from renewable resources, the enhancement of their properties, and their distribution and acceptability.

Relationship to Other Departments and Programs The current TXC faculty has distinguished organic materials expertise and research programs, especially in fibers, polymers and fibrous products. We have the only undergraduate programs in the areas of Fiber and Polymer Science (FPS) and Textiles and Clothing (TXC) within the UC system. These programs are also unique to California and the western U.S. Other CA&ES departments with potential interest in biobased materials and processes include Biological and Agricultural Engineering, Food Science and Technology, Plant Sciences, Environmental Science and Policy and Agricultural and Resource Economics, along with several others on campus. Curricula related to biobased materials and processes would serve students in CA&ES and elsewhere on the campus. It would prepare graduates at all levels for the leading industry sectors in California and in the nation, including agricultural, apparel, food, biotechnology, pharmaceutical and consumer products.

Existing strengths of the Division The TXC faculty are committed to the development and expansion of our educational programs and research endeavours in the biobased materials and products area. The Division has been central to two biobased initiatives supported by CA&ES, i.e., the "Biobased Product Initiative Seminar" in 2004-5 and the "Biobased Fuels and Materials Seminar" in 2006-07. Currently, our faculty leads yet another new seminar series on "Sustainable Materials for Human Health and Environment" and the preparation of an IGERT pre-proposal on the same topic. The faculty takes pride in our multi-disciplinary curricula in both majors and in the inter-disciplinary approach used in several of our joint research projects. Our current strength in the Fiber and Polymer Science curriculum serves as a strong foundation for logical expansion and development of new lecture and laboratory courses on biobased materials and chemical feedstocks. Our materials analyses capability and research facility built over the years for fiber and polymer research are well suited to host and to support the research needs of the new FTE positions in the biobased products area. Our faculty leads the college and campus in research on organic materials, in particular polymers and fibrous products, and on advanced materials from natural products and utilization of agricultural products in textile applications. We have ongoing materials research in areas such as polysaccharide chemistry, organic synthesis and conversion of sugars, nanofibers and nano-porous materials, carbon nanotube assemblies for energy storage, and textile dyeing with nano-particles. New extramural funding has been granted on several projects related to research in these new areas, and patents are pending.

Programmatic Priorities in Biobased Materials The TXC faculty is committed to the following key roles toward building a center of excellence in biobased materials and processes in the CA&ES and on campus:

- Recruit and retain new faculty and CE FTEs in areas of biobased materials and products
- Develop and champion undergraduate and graduate curriculum and courses by expanding current FPS coursework and coordinating with other programs such as BAE, FST and Plant Sciences.

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- Collaborate and coordinate with faculty, researchers, CE specialist and county personnel on research and issues related to: exploration of current and new crops for chemicals, polymers, materials and products; processing and conversion; product development and engineering; biobased production systems; material culture; life cycle analysis; and environmental, ethical, and policy issues.
- Seek extramural funding at all levels of federal, state and private.
- Develop international collaboration and student and scholar exchange programs

Instructional Priorities Our current undergraduate curriculum in fiber and polymer science includes some biobased materials content. FPS 161 covers natural (cellulose and proteins), regenerated and synthetic fibers whereas FPS 150 focuses mainly on synthesis and reactions of synthetic polymers. Expansion of these two courses to include biobased materials is the logical first step. For instance, only cellulose fiber and chemistry are included in these courses. The expanded course offerings would allow contents on a broad range of proteinacious materials, other polysaccharides (chitin, starch, pectins), ligno-cellulosic polymers (polyphenols) as well as their derivatives. Each can be expanded into two courses, one emphasizing natural and biobased materials and the other synthesized or integrated them in sequence. We can also reinstate two courses that have not been taught for a while, i.e., TXC 165 and FPS 110, to emphasize contents related to conversion, processing, product development and life cycle analysis of biopolymers and biobased products. For instance, use of enzymes in bioprocessing of fibers and textiles and in decoloration of dyes and detoxification of chemicals in industrial waste streams can be included in TXC 165. Utilization of cellulose from broader range of plants and microbial sources as fibers and recycling and reuse of rubber, plastics and paper products, as well as the health and environmental impacts of chemicals used in consumer fiber and polymer products can be added to FPS 110. At the graduate level, advanced contents in these areas can be developed and incorporated in the FPS 250A-F series.

Educational Impact These expanded biobased materials curricula would give students in the CA&ES, DBS and Engineering new and contemporary material perspectives and expanded scientific knowledge, and will help to build a solid and comprehensive polymer and material science program that can provide students with multidisciplinary views. The biobased material curricula will better prepare students to be future leaders (educators, scientists, engineers, policy makers, etc.) toward a biobased economy. These curricula satisfy the increasing demands of students, both undergraduate and graduate, for programs and courses that meld biology and engineering and produce qualified graduates for the rapidly expanding biomaterials, biologically-derived chemical products and bioenergy industries in California and across the nation. At the doctoral level, a Designated Emphasis (DE) in the area of biobased materials could serve students across campus.

Possible Research Focuses The research areas are wide ranging and may include 1) natural products chemistry, biochemistry and bioconversion: a) carbohydrate, protein and macromolecular chemistry; b) biochemical and advanced engineering processing; c) biosynthesis and conversion; 2) bioproducts and biomaterials: synthesis and characterization of advanced materials, catalysts, stimuli-responsive materials, biopolymers and nanomaterials; and 3) human and environmental impacts of new and/or alternative biobased products.

Outreach and Extension This CE specialist is expected to face the great challenges of embarking on a new biobased materials and products program while working with the vast and diverse agricultural industries and environmental groups in California. Strategies that may help to determine top statewide needs and establish effective and meaningful connections include working with: 1) CE specialists in major commodity areas including cotton, food, wine and other agricultural products; 2) faculty and researchers who have close links with the various sectors already; 3) alumni who are working in the related private and public sectors; 4) National Textile Center projects and industry sponsors.

Appendix II. (continued)

FTE Proposal II ***Human and Environmental Health***

Background and Existing Strengths

The Division of Textile and Clothing is a recognized leader nationally and internationally in studies of personal protective clothing, biobased materials, nanofibers, consumer behaviors and social, trade and marketing studies of textiles. The existence of multidisciplinary research and education on textiles and interdisciplinary interactions has been the unique strength of this program. Faculty in this department have been involved in research activities funded by National Science Foundation, National Textile Center and other federal and state agencies as well as industry, and also have formed collaborations with several departments within CA&ES, on campus, and other institutions.

Currently, emerging infectious diseases, environmental contamination, and consumer product safety and environmental health as well as potential terrorist attacks have posed new challenges to textile scientists. Moreover, such challenges come from different directions so that solutions for them often compete with each other.

To fend off any hostile attacks to the human body, we need to develop new and better functional materials for protective clothing. Given the intimate relationship between clothing and the human body, clothing with desired functionality still provides the most effective protection to the human body, and is still the current focus of research and development of textile materials worldwide for better functionality. Increased funding and funding opportunities are available from several federal agencies, including the NSF, NIH and CDC/NIOSH environmental and human health, NIOSH and DHS personal protection, and various DOE and EPA programs. Clothing materials as human's second skin can provide protection against many environmental hazards, as exemplified by increasing development and improvement of biological, chemical personal protective clothing and textiles in battling transmission of infectious diseases, chemical warfare agents, and fire.

On the other hand, increasing functionality often involves using new chemicals and chemical finishes, which has led to augmented human health and environmental concerns. Examples include human safety hazards associated with brominated flame retardants, antimicrobial agents, surfactants, insecticides, and colorants in consumer products. In recent decades, however, the development and use of functional materials and chemicals have created unforeseen consequences to human and environmental health which require interdisciplinary effort to resolve. These issues have increasingly become the focus of growing concerns globally by more and more government agencies.

Therefore, we have to address issues related to human safety, sustainability and environmental health of the materials in more comprehensive and systematic ways. We also have to develop better understanding of consumer perception and acceptance of the new products. In fact, there is increased interest from future students and the community on cutting-edge and

interdisciplinary fields that link development and use of functional textile materials and chemicals to human health and environmental protection, green chemistry and sustainable development of new generations of functional materials.

In fact, the public wariness of the potential adverse effects of textile clothing on the wearers is not unfounded. The sudden emergence and increase in diseases such as asthmas and allergies among children, is found to coincide with starting application of some chemicals on clothing for certain functionality. Their impacts on the environment also trigger public suspicion towards those chemicals. The development of new textile materials and related chemicals calls first for re-examination of a broad range of issues through multidisciplinary efforts. Furthermore, introduction of any new materials should consider the trade offs between the novel functions against a particular hazard, and the side effects brought to human health and the environment. A thorough economic, environmental and risk assessment of the sustainable materials-green chemistry concept has become imperative. But, most of the scientists educated through the traditional discipline-oriented systems are not best equipped to deal with problems of such complexity due to the lack of perspective in cross-disciplinary interactions and relationships among related areas. Coupled with increasing public awareness of emerging diseases, product safety, sustainable development and environmental protection in recent years, there is an urgent need to have a new FTE whose expertise is in Human and Environmental Health.

Relationship to departmental needs and instructional priorities

Sustainability, human and environmental health aspects of textile materials involve chemical engineering, biology, chemistry, environmental science, policy, social science and marketing and economic studies. Faculty in this department have been working with members in the departments of entomology, environmental toxicology, ag engineering, and others related. These departments have already identified environmental and human health related topics among their current gaps and/or priorities. Many high school graduates in urban areas are interested in majors that can provide education and career opportunities in this emerging area. At the same time, job opportunities in the health areas favor those with more multidisciplinary training. Realizing the growing interest in human health and protection, a School of Public Health (SPH) is planned to open soon on our campus. It has been envisioned that the new SPH will differ from UCB's and other existing public health schools in that it will focus on public health in relation to agriculture and the environment. The addition of a new FTE in this area of textile/human interface in our division can form partnerships with the SPH and broaden the human science research in our college. The position will significantly enhance the interactions of the textile department with other departments and will serve as a bridge between our college and the SPH for synergy and mutual benefits.

First, functional and smart textiles that can provide health benefits to humans are of great interest to consumers and manufacturers. Any course and research activities related will be attractive to both undergraduate and graduate students. Functional textiles span from liquid repellent, controlled release of fragrance and medicine, to biological and electrical responsiveness. There are more and more demands on specially functioned textile materials because of the intimate and ominous contact between textiles and the human body. The development of textile materials with these functions will acquire potential financial support

from NSF, NIH, and NTC, as well as industry. This area may require the potential candidate to have expertise in polymer chemistry, material science, textile production and engineering, biology, and physics. The teaching and research activities in this area will build wide connections with other departments and programs in materials sciences, chemistry, public health, biomedical engineering, etc.

Second, professional and occupational protection is an area that has attracted attention from end users or professional, manufacturers and federal agencies, particularly after the terrorist attack on 9-11. Currently, emergency workers do not have proper protection against any bio- or chemical attack with their existing uniforms; healthcare workers and the general public do not have effective protection against influenza; military personnel also lack chemical and biological protection in battlefield uniforms. There is a high need to study and develop functional textiles for chemical and biological protective clothing, specialty uniforms for different professionals to improve protection levels and address many other related issues. This area of education and research has great potential to attract research funding on one hand and students to study on the other.

Appendix II. (continued)

FTE Proposal III

Transnational Production and Consumption: Comparative Studies

Materials need to be produced in order to be consumed. And, without a consuming market, there would be no need for material production. The interdependence of production and consumption, however, has been undermined by a global “disconnect” between production issues such as environmental resources (e.g., water subsidies, pesticide use, chemical wastewaters) and garment (and agricultural) labor, on the one hand, and consumption (e.g., identity, perception, cultural meaning) issues, on the other. Materials and their lifecycles have inordinate implications for the global culture, economy, and environment alike. These lifecycles pertain to human and natural resources, as well as the transnational circulation of textile and other consumer products. The textiles complex has one of the most complicated systems of linkages and constraints on trade; it has become even more complex with the “flattening” of the world, as a result of major economic and political changes as well as dramatic developments in communication and transportation. This FTE request addresses the need to foster new, comparative ways of bridging transnational production and consumption. Building upon the historical strengths of the Division of Textiles and Clothing in the area of consumer behavior, this position is based upon the anticipated retirement of a TXC faculty member in 2009.

Background

Transnational production-consumption studies is a newly emerging field that draws on, and integrates, the existing, currently burgeoning fields of consumer behavior, cultural studies, the sociology of consumption, political economy, cultural theory, and environmental and sustainability studies. Evidence of the new vitality of this emerging field is evident in the recent development of journals such as *Consumption, Markets, and Culture* and *Journal of Consumer Culture*, as well as academic and popular attention to garment labor, “green” materials and processes, and other issues linking consumer ideology with the means of production. Transnational production-consumption studies bridges the humanities and social and natural sciences, and pursues some of the most urgent social, environmental, and ethical issues confronting us today. Offering a fresh analytical approach that moves beyond the “disconnect” between production and consumption in a highly globalized economy, transnational production-consumption studies re-imagines consumption as more than the end of a pipeline or “value chain.” At the same time, this emerging field re-imagines production as a site of social and environmental responsibility, as well as profitability. Among the research areas pursued in this field are:

- ethical issues confronting consumers, in relation to the conditions of production (e.g., labor, the environment);
- international sourcing; the material resources for, and consequences of, human production and consumption;
- comparative studies of gender, race, ethnicity, national identity, class, and other identities associated with production and consumption in a transnational framework;

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- cultural discourses that have the potential to link production with consumption, beyond advertising or image construction alone.

Existing Strengths on Campus and in the College/Relationship to Other Departments and Programs

On the UC Davis campus, the Division of Textiles and Clothing has the longest and most consistent history of research and teaching in the field of consumer behavior. Recent interest has also been expressed in this area in the humanities division of the College of Letters and Science (e.g., American Studies, Women and Gender Studies), as well as in Food Science and Technology, and Viticulture and Enology in CA&ES. The College of A&ES desperately needs to address the interface between production and consumption; this interface underpins virtually every science-society controversy. This FTE request meshes extremely well with the area of public perceptions of science, highlighted in the CA&ES Academic Plan. It also interrelates with the areas of biobased materials (i.e., the consumer and cultural contexts that shape responses toward such materials and toward issues of sustainability in general), as well as human health and the environment.

There is tremendous potential to do some campuswide planning to assume leadership in the area of transnational production-consumption studies. Faculty in departments ranging from American Studies to Women and Gender Studies, African and African American Studies, Chicana/o Studies, Asian American Studies, Native American Studies, and Nature and Culture have interests and strengths in areas such as food studies, fashion studies, and environmental studies, technology, and related areas that pivot around issues of consumer behavior, culture, and perception. Additionally, faculty members in Anthropology, Sociology, and Science and Technology Studies have interests in themes of sustainability, technology, material culture, and popular culture. The Cultural Studies Graduate Group provides an intellectually rich and lively context to bring together faculty and graduate students across the CA&ES, and the HArCS and Social Science Divisions of the College of Letters and Science.

Existing Strengths in the Division

For over 30 years, the Division of Textiles and Clothing has been a leader in the CA&ES in the area of consumer and social sciences. This was accomplished with only two FTE (Professors Rucker and Kaiser), in addition to Professor Howard Schutz, whose independent Consumer Science program was housed with Textiles from the late 1970s until his retirement in the 1990s. The current strengths pertaining to consumer behavior range from marketing to cultural studies, with specific emphases on identity issues such as sustainability in apparel production/consumption; corporate social responsibility; gender and ethnicity; consumer gift giving; and fashion theory. The social science faculty also foster critical bridges with the physical and biological sciences through collaborations leading to successful grants with the National Science Foundation and the National Textile Center. For example, the NSF MUSES (Materials Use: Science, Engineering, and Society) grant with Professor Gang Sun seeks to bridge the divide between nonwoven (disposable) and woven (reusable) textiles in the medical field. The safety, economic, environmental, and political complications surrounding medical

textiles necessitate a strong science-society interface in order to make a difference in potential standards and policies.

The social science faculty's strong collaborations with other faculty within the Division, across the College, and throughout the campus have contributed to the development of interdisciplinary innovations such as the Science and Society program and the Cultural Studies Graduate Group.

Instructional Priorities and Majors

The area of consumer cultural studies is critical for undergraduate students within our curricula. More than 75% of our undergraduate students express a primary interest in issues of consumer behavior, cultural studies, product development, and marketing. Furthermore, our courses in these areas draw large numbers of general education (a number of whom change to our major as a result), serve our minors, and provide the only fundamental background available on campus in the area of consumer behavior. At the graduate level, a similar pattern emerges. Our courses in this area not only serve our own M.S. students, but also have helped to draw Cultural Studies Ph.D. students into studies that blend consumer issues with cultural dynamics.

The Division of Textiles and Clothing is well positioned to develop the field of transnational production-consumption studies. Foundational courses (TXC 8 and TXC 174) in this area have been taught for more than two decades. TXC 174 serves to fulfill a requirement for International Ag Development as well as Textiles and Clothing majors; students from a variety of other majors have also enrolled in the class each time it is taught. We feel that it is essential to have FTE in this area to maintain our foundation courses and to expand in the direction of production-consumption studies, building upon faculty experience and connections with government agencies such as Customs and Border Protection and the Sacramento Regional Center for International Trade Development, as well as private industry.

We envision collaborating with faculty in Food Science and Technology, Viticulture and Enology, American Studies, and Women and Gender Studies, to work toward the development of a possible undergraduate minor and/or graduate Designated Emphasis in the area of transnational production-consumption studies.

Outreach and Cooperative Extension:

Numerous opportunities exist for outreach to the textile/apparel and other consumer industries, as well as to consumers and governmental agencies. We envision networks that link consumer, industrial, and governmental and nonprofit perspectives to address critical issues ranging from sustainable consumption to cultural diversity.

Appendix III.

Center of Excellence

Biobased Materials and Green Products for Health, the Environment, and Culture

Drawing upon the above three priority areas and building upon our disciplinary and interdisciplinary strengths, we propose a center of excellence in Biobased Materials and Green Products for Health, the Environment, and Culture. We would like to expand our efforts--in collaboration with colleagues from the Departments of Biological and Agricultural Engineering, Environmental Toxicology, and Entomology, as well as the School of Public Health and the UCD Medical Center—to develop a center of excellence with disciplinary strengths and interdisciplinarity to broader areas of sustainable materials for human health. A center of excellence for sustainable biobased materials is a natural extension of our strength in natural fibers and green chemistry. Our current fibrous and polymer materials expertise offers the core competency for leading programmatic initiatives as a key player in the area of biobased chemicals and products for the college and campus.

The proposed center extends and integrates our current AES projects, which address biobased materials and consumer issues such as comfort, culture, performance, preference, and safety. These projects provide the critical knowledge base for government agencies (including the military) and other public safety and health organizations such as firefighters, first responders, and emergency and medical personnel. We actively seek and address national and international issues related to human protection and public health, environmental sustainability and protection through an integration of fundamental physical and social sciences. For example, our current project funded by the National Science Foundation addresses the biocomplexity associated with material uses in hospital settings. Using a framework that integrates physical and social science perspectives, we are questioning the fundamental premises underlying the dichotomous debate between “nonwoven, disposable” and “woven, reusable” medical textiles. We are examining both physical (i.e., property-based, resource, technical) and social (i.e., cultural/historical, economic, perceptual) dimensions of the debate, so as to foster a more thorough understanding of the issues at play and to arrive at new ways of framing the debate with scientific facts and meaningful outreach strategies.¹

This center of excellence would address areas of research such as:

- Biobased and other sustainable materials, including their resource base, physical properties, economic feasibility, consumer acceptance, sustainability, related policy, and lifecycle analysis. With established strengths in biological sciences, biotechnology, plant sciences, engineering and medicine, a center of excellence in

¹ Parallel activities have been taken place in other places. For instance, the US Army’s MIT Institute for Soldier Nanotechnologies (*ISN*) aims at reducing the current soldier non-weaponry carry on load by a half, and it is impossible without a new generation of functional materials. *ISN* research is divided into three broad capability areas that cross disciplinary boundaries: protection; injury intervention and cure; and human performance improvement.

bioenergy/biofuel has taken shape on campus recently. The areas of biobased materials and products are, however, lagging behind. With our prior and continuing collaboration with others in the CA&ES and across campus, we are poised to take the leadership in the area of biobased materials and products by bringing together efforts in plant biology, processing and conversion. Investment in these areas would expand our ability to be at the forefront and the interfaces of the physical, biological, and social science dimensions of materials: their derivation from renewable resources, the enhancement of their properties, and their functionality and acceptability. Biobased materials and processes fit within the foundation areas of agricultural systems and environmental sustainability. They also link to the programmatic areas of genomics, science, the public and governmental policy.

- Functional textiles, spanning from liquid repellence, to controlled release of fragrance and medicine, to biological and electrical responsiveness. Textile materials maintain the closest contact with human skin, and can serve as a “second skin” for human protection. Functional textiles offering human health benefits are of great interest to consumers and manufacturers, as well as to undergraduate and graduate students. The development of textile materials with enhanced functionalities will be pursued with potential financial support from NSF, NIH, and NTC, as well as industry.
- Professional and occupational protection is an area that has attracted attention from end users, manufacturers and federal agencies, especially since the terrorist attacks on 9-11-01. For example, emergency workers do not have proper uniform protection against biological and chemical agents. Healthcare workers and the general public do not have effective protection against influenza; military personnel also are lacking chemical and biological protection on their battlefield uniforms. There is a great need to study and develop functional textiles for chemical and biological protective clothing, and specialty uniforms for different professionals to improve protection levels and related issues. This area of education and research has great potential to attract research funding and students.
- Intelligent, self-adjusting, smart or even wearable computers are the terms frequently used to describe a new generation of clothing which is increasingly appearing in the consumer market. The intimate nature of clothing --- it is always with us ---combined with its newly rendered interactive-abilities with external processes through smart clothing will surely revolutionize our daily life, our work and ourselves.

Another increasingly important area is the so-called biomedical fibrous material, and early examples include textiles used as surgical gowns and bio-barrier materials and sutures. However, with the gradual realization of the unique properties of fibrous materials such as their porous and pliable structure, lightweight and soft tactile touch, they have been increasingly used in wound dressing, drug delivery patches, artificial organs and cell cultivating substrates. Their shape-ability, durability, permeability, formability and flexibility make them nearly perfect materials for tissue engineering, vascular grafts and other artificial organs. In fact, fibrous materials for such medical applications have been growing in both quantity and quality for decades and such growth will both accelerate and continue well into the 21st century.

APPENDIX IV.
Faculty Appointments, Grants, Recognition, and History

a. Faculty Appointments

<u>Faculty</u>	<u>Appointed</u>
Gang Sun	July 1, 1995
Ning Pan	July 1, 1990
You-Lo Hsieh	July 1, 1981
Susan B. Kaiser	July 1, 1980
Margaret H. Rucker	July 1, 1977

<u>Emeriti</u>	<u>Appointment</u>	<u>Retirement</u>
Gyongy Laky	1978	2005
Stephen C. Jett	1964	2000
Howard L. Needles	1969	1994
S. Haig Zeronian	1968	1994
Mary Ann Morris	1962	1987

b. Extra-Mural Grants (2000-2007)

	2000-1	2001-2	2002-3	2003-4	2004-5	2005-6	2006-7	Totals
Others	\$163,552	\$142,757	\$253,239	\$169,323	\$1,750,122	\$152,910	\$198,000	\$2,829,903
NTC	\$0	\$0	\$230,750	\$870,755	\$860,873	\$858,312	\$1,158,571	\$3,979,261
Total	\$163,552	\$142,757	\$483,989	\$1,040,078	\$2,610,995	\$1,011,222	\$1,356,571	\$6,809,164

c. Special Recognition

A recent peer-reviewed article, "Bench Marking for Strategic Planning Using Frontier Analysis of Faculty Productivity," published in the Clothing and Textile Research Journal has found, based on TAPPI data, the textile programs at UC Davis and Cornell to be the most outstanding in terms of research achievements [Laughlin, J., & Kean, R. C. (2002). Bench marking for strategic planning based on faculty productivity. Clothing and Textiles Research Journal, 20(3), 147-155]

Our faculty has served in significant leadership roles in our scientific fields, including serving as Presidents of major professional organizations (The Fiber Society and the International Textile and Apparel Association) and on major journal editorial boards (Cellulose, Journal of Cotton Science). Individual faculty members and the faculty as a whole have won numerous awards. The faculty as a whole won the American Textile Manufacturers Institute Excellence in Teaching award in 1993. Other awards include the American Chemical Society's Anselme Payen Award, Fellowships of the International Textile and Apparel Association, Fellowships of the Textile Institute, Fellowships of the Cellulose, Paper and Textile Division of the American Chemical Society, Fiber Society Founder's Award and Lectureships, and the 20th Century Award for Achievement, International Biographical Centre medalist.

d. History

The Division of Textiles and Clothing was established in 1974 as an offshoot of the Department of Consumer Sciences. The unit traces its roots to the home economics programs at Berkeley and Davis. When home economics at Berkeley was phased out, two faculty who taught in the textiles and clothing area, Mary Ann Morris and Agnes McClellan, were invited to become part of the expanded program at Davis. At the time, in 1962, little research in textiles was being done at Davis. Therefore, the move required extensive remodeling of the home economics building to accommodate new research needs, including construction of a constant temperature and humidity room so that testing of textiles and other materials could be done under standardized conditions.

In the mid 1960s the Davis program in home economics went through a number of structural changes that resulted in the formation of several new departments, including the Department of Consumer Sciences, under the administration of the associate dean for Family and Consumer Sciences. The Department of Consumer Sciences was composed of faculty from textiles and clothing, consumer foods, and consumer behavior. A few years later, the consumer foods faculty moved to the Department of Food Science, and in 1974 the department was renamed the Division of Textiles and Clothing to reflect the focus of the remaining faculty. By 1977 there was sufficient critical mass in the area of textiles to offer a M.S. in Textiles while Ph.D. degrees were offered through the Agricultural Chemistry graduate group, Ecology and the Independent Ph.D. program. Prior to 1977, students at the master's level could major in Home Economics or Consumer Sciences with a concentration in textiles. In the 1960s and 1970s, faculty research centered primarily in textile science, with a focus on consumer end uses. Research was conducted in the areas of comfort and safety (e.g., air pollution, flame resistance) and the chemistry and physics of natural and synthetic fibers. Hiring of faculty with backgrounds in the social sciences in the late 1970s and early 1980s resulted in expansion of research to include the psychological, social, and cultural aspects of clothing.

Today the unique strength of the textiles program derives from disciplinary expertise in areas ranging from fiber chemistry, polymer science and textile engineering to consumer psychology and cultural studies as well as its interdisciplinary perspective on commodity-relevant issues. Special areas of emphasis and excellence include cotton fiber quality, textile marketing and cultural diversity, biomaterials, natural products, functional textile products for health and safety, and consumer decision making. The division offers the only textiles programs (B.S. in Textiles and Clothing, B.S. in Fiber and Polymer Science, M.S. in Textiles, and Ph.D. related to either chemistry or engineering aspects of fibers and polymers) in the UC system. Our graduates have contributed to many sectors of California's fiber/textile/apparel industry, the nation's second largest, including research on many related advanced materials in the public and private organizations as well as education and research at the universities in the U.S. and internationally.

In 2002, UC Davis became a member of the National Textile Center, a research consortium of eight universities. We share human resources, equipment and facilities to produce innovative, collaborative research partnerships to enhance and expand the knowledge base for the continuing viability of the U.S. fiber/textile/fiber products/retail complex. The funded research improves our ability to involve undergraduate student in research, sponsor graduate students, acquire new equipment and sponsor summer research internships for undergraduate students.

APPENDIX V.

Undergraduate Majors

We offer two undergraduate majors: Textiles and Clothing (TXC) and Fiber and Polymer Science (FPS). The objectives of our undergraduate programs are:

- to provide graduates with a solid foundation in physical and materials science, fibrous products, social and behavior of science, marketing and economics, communication and analytical skills.
- to make connections between the physical and social sciences; to integrate technological and business issues with those of consumer, ethical, environmental, societal, and global well-being (including issues of race, labor, class, trade, resource, and other issues that influence how and why materials come to have meaning and to be or become sustainable in the long run).
- to place materials and ideas in their larger contexts (physical, social, cultural, global), coupled with an advanced level of disciplinary orientation
- to give graduates a competitive edge to enter professions and careers in diverse public and private sectors as well as advanced studies.
- to serve the long-term goals of students to develop professional interests and careers to meet future human materials needs in a sustainable manner.

Both the TXC and FPS majors support the educational objectives of the UC Davis campus and the College of Agricultural and Environmental Sciences in a number of ways:

(1) The FPS and TXC programs develop students into scholars, mentors, and responsible citizens who understand the multiple connections between the scientific and cultural issues in California, the US and the world. For example, the curricula locate scientific principles and advances (e.g., new textile materials and processes) within the larger context of environmental and cultural issues confronting a global economy. In addition to TXC and FPS majors, several courses (TXC 6, 7, 8, 107, 162, 162L, 173, 174) offer a general education to students across the campus. TXC 6, 7, and 8 and CNS 100 are offered during Summer sessions. Additional courses including new courses related to biobased materials and sustainable consumer products are being discussed for future offerings in the Summer.

(2) The FPS and TXC programs educate students to advance, integrate, evaluate, and communicate scientific knowledge pertaining to the quality of fiber and textile products, the health and quality of the lives of those who produce, distribute, and use these materials and products; and to work for governmental agencies who oversee these processes. For example, faculty bring research pertaining to protective clothing worn by medical and military personnel, farm workers and firefighters directly into the classroom to illustrate the integration of the physical and social science principles in understanding safety and comfort. Our textiles and apparel industries and apparel production courses (e.g., TXC 8 and 164) highlight the issues associated with environmentally responsible technology, labor and working conditions, industrial efficiency, as well as cost and benefit.

(3) The FPS and TXC programs encourage students to seek out, anticipate, and lead in addressing the needs of citizens and communities, particularly in California. For example, textile-related coursework in cultural studies (TXC 7), social psychology (TXC 107), and world trade (TXC 174) draws on faculty research pertaining to variations in consumer cultures as a function of gender, race/ethnicity, nationality, and sexuality.

(4) The FPS and TXC programs prepare students to contribute to the California's textile and apparel industries, the largest in the country, and other related public and private organizations upon graduation and eventually become leaders in a broad range of professions nationally and internationally. Dyeing and chemical finishes of textiles, as well functional performance taught by TXC 163, 163L and 171 are useful for students working with apparel and sportswear companies.

a. Textiles and Clothing Major

The Textiles and Clothing (TXC) major emphasizes the connections among (a) the physical characteristics of textile products, (b) human perceptions of and behavior toward these products, and (c) global economic trends affecting the textile/apparel marketplace. The major is based on the premise that an integrative knowledge base is needed to link textile products with social and behavioral processes such as the production, distribution, and consumer use of textiles and apparel. We also offer a Textiles and Clothing minor.

Students can select between three options (Marketing/Economics, Product Development and Evaluation, and Transnational Fashion Studies) to pursue the one best fit with their post-graduate academic and career goals. The Marketing/Economics option emphasizes social science and business coursework, while also providing students with an awareness of the physical nature of textile products. Students combine depth coursework in microeconomic theory, quantitative methods, and managerial marketing with integrated coursework in textiles and clothing sciences. The Product Development and Evaluation option provides students with a broad knowledge base in both the social and physical sciences. The Transnational Fashion Studies option draws on concepts from social psychology, economics, and cultural studies to provide students with an excellent background for careers in fashion journalism, cultural critique, technical writing, law, public relations, education, library services, and museum studies. Students obtain an integrative understanding of the physical and chemical properties of textiles in relation to production processes, consumer behavior, and end-use applications.

TXC majors assume positions in apparel and retail companies such as Mervyn's, GAP, Ariat, Koret, Levi Strauss, Nike, Adidas, VF Corporation, Patagonia, Gottschalk's, and Royal Robbins and research positions at places like the US Customs Lab, The North Face, and the Bureau of Home Furnishings. We regularly bring alumni back to the campus to lecture in courses or present special seminars. The comments from our alumni confirm our suspicions that the breadth and depth of the TXC program, along with the interdisciplinary training and technical skills in textile science added to their success and career development. Employers seem to be especially appreciative of how our students think critically and abstractly, know how to find resources, and know how to communicate clearly (both orally and in writing).

Our students participate in other research and creative programs to supplement our educational

goals. Students organize an annual charity fashion show that highlights sustainable/green student designs. Several students work on research projects (some through the National Textile Center) in TXC 98, 99, 198 and 199 courses.

We offered career development seminars as TXC 98 or 198 in the Winter quarters of 2003 and 2004, the Fall of 2005, 2006, Spring 2007 and Fall 2007 that brought current students together with alumni to focus on career skills development, resume and cover letter writing, interviewing techniques, and networking.

b. Fiber and Polymer Science Major

The Fiber and Polymer Science (FPS) major provides students with a solid foundation in physical and materials science including mathematics, physics, chemistry, fibers and polymers. The major requires preparatory courses in physics, chemistry, and mathematics, and depth subject matter classes in fiber and polymer science, organic and physical chemistry, and scientific writing. Additional courses in chemistry, material science and engineering, computer science, and textiles are required as restricted electives. A minor in Fiber and Polymer Science is also available.

The FPS major integrates polymer science (FPS 100, 150) and fiber science (FPS 161, 161L) components with textile science (TXC 162, 162L, 163, 163L, 171). The upper division TXC 171 (Clothing Material Science), team taught by the entire TXC faculty, has developed into a capstone course for both TXC and FPS majors. It integrates physical and social science principles in the studies and analyses of functional protective clothing. The restricted electives for the major include physical science, material science, and computer courses as well as classes in other areas such as economics and statistics to prepare students for the technical marketing/management of polymeric products and fibrous materials. FPS students participate in research in preparation to selecting a faculty mentor (FPS 198, 199) and as part of their senior thesis (FPS 180A,B).

The strength of the Fiber and Polymer Science (FPS) undergraduate program lies in its focus on fibers and textiles from the vantage point of polymer material science. In addition to serving FPS majors, the FPS course offerings and faculty expertise in polymer research have served the increasing needs and interest in polymer materials science on this campus. The polymer science curriculum has been welcomed and well supported by Chemistry, Chemical Engineering, Food Science and Technology, and Material Science on campus. The polymer courses have attracted undergraduates and graduate students from the above departments, as well as biochemistry, and Agricultural and Environmental Chemistry. The interest of students reflects to a large degree the nationwide fact that over 50 percent of chemistry and chemical engineering graduates have proceeded to careers in polymer-related fields in recent years.

The 2004 National Science Board reported that the number of American eighteen-to-twenty-four-year-olds who received science degrees has fallen to seventeenth from third in the world three decades ago. The Fiber and Polymer Science major provides material science education in the context of everyday products, such as the fibers we wear to personal equipment and household products we use, as well as high-performance industrial and structural materials. The

curriculum is built around physical science and polymer materials with strong emphasis on hands-on laboratory and research experience toward solving application-oriented problems. Our students are well prepared either for advanced degree programs in polymer or fiber science, or to enter careers holding technical positions related to the science and engineering of biobased fibrous materials and polymer plastic product development.

The rigor of the FPS major provides a very well-rounded scientific education in material science that enables many options for careers and advancement. The same rigor also means tough course requirements, which tends to discourage some students. With the number of admitted students for Fall 2006 reaching an all-time high of 23, considerable increase in enrollment is anticipated for the next few years. We will continue to find ways to attract science-oriented students by increasing our visibility on and off campus, improving communication with prospective students and highlighting career opportunities in many of the related fields.

c. Advising

The TXC and FPS programs have an excellent advising and support system. Most of our majors are on a first name basis with our advisers and our Academic Peer Advisers. We schedule individual appointments with all students to do a two year plan and have excellent success guiding our students through to graduation in four years. We forward e-mail information about internships, workshops, career fairs, courses and career positions on an almost daily basis. We have conducted courses (TXC 198) that help students become aware of possible career positions in the field and career development techniques. We track our alumni and have a database of their information. We have wonderful support from the alumni for attending our special events, speaking in classes and providing us with their company position announcements.

Freshman Career Discovery Program We have offered a section, Fashion and Apparel in the 21st Century, in the Freshman Career Discovery Group (SAS 5) for the past two years and we plan to continue to support this helpful program. As part of this program we bring in a panel of alumni each week during fall quarter to discuss their careers. This class is also open to sophomores, juniors and seniors who take it as a TXC 98 or 198 so everyone can benefit from the advice and networking. Last year (W'07) we had about 50 students and this fall (F'07) we had another large group. We have a graduate student who mentors the freshmen with outside activities (Winter '08 and Spring '08) to San Francisco, Fashion Week, and other enrichment and social events.

d. Recruitment

Outreach to High Schools The initial model of this outreach effort to the regional high schools was created in the Fall of 2006 and we have continued this "recruitment team" effort by working with student ambassadors to visit their former high schools to discuss our programs. Thus far, science and clothing classes have been our main target.

"Where Science Meets Fashion" In Fall 2007 we sponsored our first Open House, "Where Science Meets Fashion", to promote our TXC and FPS programs to high school students and their parents who attended Preview Day. We advertised this new event electronically and by

post cards. On the day of the event, we presented career and internship seminars by alumni and current students and conducted a variety of hands-on activities to help potential students understand our majors and prepare for our programs. Seminars and workshops included 1) Advising, 2) Career Opportunities, 3) Current Student Panel, 4) Alumni Panel, 5) CSI - Fiber Identification Workshop, 6) Research Opportunities, 7) Tours of the dept, and 8) tie-dye workshop. The event was very successful and we plan to continue to sponsor it. We also participated in the major faire in the ARC during the early afternoon of Preview Day.

"Picnic Day" Picnic Day is another recruiting opportunity that has a long department tradition. Our current students and the Student Fashion Association (SFA) sponsor a fundraising tie-dye event that is a favorite for people of all ages who want to experiment with tie-dye techniques.

e. Internships

Our students take internships in many different areas including merchandising, testing, retail, PR, journalism, production, and marketing. Many of the internships are located in the Davis/Sacramento area or the bay area, but some are completed in LA, NY, or London during the summer months. Each year we average about 17 internships that are mostly held by juniors and seniors who have completed some of the core courses that will be helpful to the company.

Recent internships have included the following: Abercrombie and Fitch, Aquascutum, Aztec Production Inc, Banana Republic, bebe, Brower Lewis PR, Cal Aggie Newspaper, Cost Plus World Market, Crossroads Trading Co, Dirty Laundry, Disney, E*Trade Financial, E- Luxury, Ella J Boutique, Elle Magazine, Gap, Gymboree, Halpern Public Relations, House of Frazier, HUSH, J. Crew, Jockey, Johnny Loves Rosie, Keepsakes Bridal and Tuxedo, Koret, Krazy Mary's, La Raza Cultural Days, Larenda Designs, Macys West, Mervyn's, Mountain HardWear, Pink-a-dot, Pure Beauty, Production Link, Ralph Lauren Children's Wear, Riki, Sac. Metro Chamber of Commerce, Savvy Shoppe, SF Chamber of Commerce, SF Magazine, Starbucks, Sutter's Fort State Historical Museum Sacramento, Sweet Potatoes, Target, Toyota, Victoria's Secret, Vivienne Tam, Walgreen's, The Wardrobe, Yolo Wool Mill.

f. Placement

Our graduates have a significant influence on the success and sustainability of their organizations and they continue to represent UC Davis well. In the survey in 2005, about 45% of the graduates from our undergraduate programs were placed in the textiles or apparel industries (product development, fabric analysis and testing, merchandising, marketing and design). The companies they work for include Koret, Ex Officio, Gymboree, Levi's, Clorox, The North Face, GAP, BCBG, Byer, Ariat, Adidas, Patagonia, Royal Robbins, the US Custom's lab, and Guess. Another 28% work in retail at companies such as Mervyn's, Macy's, Nixon, Gottschalk's, Target, Abercrombie and Fitch, and Papyrus. About 15% of the students are attending or have completed graduate school. The rest are in the areas of banking/finance (Wells Fargo, Franklin Templeton, Union Bank), teaching, research, and technology (Google).

g. Undergraduate Program Statistics

Majors and Student Credit Hour (SCH)

The overall FPS and TXC majors have increased by 3.5 fold over the past nine years, from 28 to 97. TXC majors have tripled from 26 in 1998 to 76 in 2007. In FPS we have seen an increase from 2 students in 1998 to 21 in 2007. We are proud of how our efforts to maintain a quality program with many sources of enrichment have resulted in a steady increase in enrollment of enthusiastic students. In 2006-07, we delivered 3,611 Student Credit Hour (SCH) or a 26.51 student-faculty-ratio using 3.0 I&R and 0.13 unit-18 lecturer.

#Majors	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
#TXC as of Fall	26	34	47	53	72	74.5	72.5	78	75	76
#TXC graduated	5	9	13	5	18	22	28	31	21	30
#FPS as of Fall	2	3	7	3	3	2	4	11	23	21
# FPS graduated	0	1	0	2	1	1	0	1	1	1
SCH	1788	2280	2010	2695	3145	2710	2531	2436	3109	NA

Number of new students who entered UCD with FPS/TXC major code as their first major:

	FPS			TXC			FPS & TXC
	JT	Fr	Total	JT	Fr	Total	Total
2000-01		4	4	8	6	14	18
2001-02	1		1	6	9	15	16
2002-03	1		1	11	7	18	19
2003-04		1	1	5	7	12	13
2004-05		2	2	4	4	8	10
2005-06	0	7	7	6	12	18	25
2006-07	3	14	17	11	10	21	38
2007-08	2	5	7	11	17	28	35

TXC Academic Plan

TXC and FPS Courses:

TXC	Title	units	Prerequisites	Academic Skills	Integrating Themes	GE	Disc	Lab	writing
6	Introduction to Textiles	4	none	basic textile materials science;	basic relations between physical structure and properties	yes	no	yes	lab report, homework
7	Style and Cultural Studies	4	none	critical, conceptual and integrative thinking; writing; communication (oral, written, visual)	connections between cultural studies concepts among identities and their intersections	yes	yes	no	weekly written analyses plus analytical term paper
8	Textile and Apparel Industries	4	none	written communication, critical thinking	complex business systems, fashion theory, ethics	yes	no	no	three essay exams
107	Social and Psychological Aspects of Clothing	4	Soc. 2, TXC 7	analysis, critical thinking, research, communication, computer	identity variables - gender, ethnicity, status, age, etc., quantitative and qualitative research methods	yes	yes	no	research project, essay exams
162	Textile Fabrics	3	TXC 6	analysis, critical thinking, research	performance, appearance, durability, standards and testing of fabrics	no	no	no	
162L	Textile Fabrics Lab	1	TXC 162 (concurrent ok)	critical thinking, theoretical applications, analysis	laboratory methods, fabric properties, evaluation	no	no	yes	Lab reports
163	Textile Coloration and Finishing	3	TXC 6, FPS 110 or CHE 8B	basic textile chemistry, textile functional analysis, research methodology	textile products, functions, colors, acceptance	no	no	no	homework assignments
163L	Textile Coloration and Finishing Lab	1	TXC 163 (concurrent ok)	experience of dyeing and functional finishing	hands on experience, chemicals, products	no	no	yes	weekly lab reports
164	Principles of Apparel Production	3	TXC 6 or 8	analysis, critical thinking, research, communication	product development, research, consumer perceptions, business, teamwork, ethics	no	no	no	written group project and presentation
173	Principles of Fashion Marketing	3	TXC 8	analysis, critical thinking, research, communication	retailing, marketing, sustainability	no	no	no	five written assignments
174	Introduction to World Trade in Textiles and Clothing	4	TXC 8	written and oral communication, critical thinking, cultural literacy	diversity, sustainability, equity, social responsibility, consumer values and competitive advantage	yes	yes	no	three written exams, weekly written assignments
171	Clothing Materials Science	4	6 and 8; senior standing; major/minor	critical, integrating thinking; writing; communication (oral, written, visual)	protection; performance; safety; health; sustainability	no	yes	yes	research project, essay exam questions
FPS	Title	units	Prerequisites	Academic Skills	Integrating Themes	GE	Disc	Lab	writing
161	Structure and Properties of Textiles	3	6, Chem 8A	fiber chemistry, physics, engineering properties	raw material sources; natural vs. synthesized polymers/materials;	no	no	no	weekly assignments; research term paper
161L	Textile Chemical Analysis Laboratory		161	chemical, microscopy and analytical methods	chemical analysis; material identification; comparative techniques	no	no	yes	weekly lab reports, unknown analysis, report and presentation
100	Principles of Polymer Materials Science	3	CHE 2A-2B; CHE 8A-8B or ENG 45	basic chem and physics	polymer structure and morphology, thermal behavior, rubber elasticity and viscoelasticity, rheological and dynamic properties, processing	no	no	no	
150	Polymer Syntheses and Reactions	3	Chem 118A, 107A	polymer chemistry; reactions;	chain vs step growth mechanisms; major reactions; structure-property relationships	no	no	no	assignments; research term paper

Appendix VI.

Graduate Education

Textiles Graduate Group

The Textiles Graduate Group is a cross campus master's degree graduate program with faculty members from the departments of Textiles and Clothing, Agricultural and Resources Economics, Food Science, Chemical Engineering and Material Sciences, and Design. Our faculty have been actively involved in several other graduate programs on campus, namely, Agricultural and Environmental Chemistry, Biological and Agricultural Engineering, Chemical Engineering and Material Science, Cultural Studies, and Forensic Science. Currently there are nine enrolled students in this program, all hosted in the Division of Textiles and Clothing, and working with faculty and other students from a wide range of disciplinary areas and academic culture.

The Textiles Graduate Group at UC Davis is unique nationally and internationally for its multidisciplinary structure and emphasis on the interface between the physical and social sciences. This interface is critical to highlight the bridge between the enhancement of material properties and the ultimate consumer acceptance of these properties. The program enables students to focus on either the physical or social science aspects of the field, while all of the students are exposed to the importance of the interdisciplinary interactions, and many students pursue projects that address this interaction directly. As a result, the Textiles M.S. program has the flexibility to prepare students for broad career paths in the private and public sectors or for further graduate work in doctoral and other professional programs.

The M.S. degree in Textiles gives students (1) an in-depth knowledge of textiles including social and physical sciences in relation to textile usage, and (2) the ability to design and conduct research in textiles and to interpret and communicate the results and conclusions. Students take coursework in textiles as well as in related disciplines (e.g., chemistry, material sciences, cultural studies, design, and marketing). The curriculum is designed with the flexibility to enable students to specialize and obtain depth in a related discipline, as well as to achieve an understanding of the interdisciplinary connections within the field.

The current coursework for the M.S. degree allows for flexibility in terms of topics and provides a good foundation for the students as they build an appropriate degree program. The nature of the interdisciplinary interactions in this graduate program has called for further curriculum development, particularly in the area of integration of both physical and social science studies on textiles. Tested in 2005, we offered a new course in Winter 2008 that addresses the interdisciplinary concerns and needs by teaching basic research methodologies employed in both physical and social science research activities, and involving students in interactive discussions and proposal preparation. We will revise our new graduate program requirements and add this course as a core requirement. We are continuing to explore ways of fostering this kind of education and research, which is quite unique to our field and in which we have tremendous individual and collaborative expertise. In addition, we are planning to develop a more complete protocol for the Plan II option of the M.S. program.

Other Graduate Groups

Faculty have joint affiliations with other programs and host mainly Ph.D. students from the following programs:

- **Agricultural and Environmental Chemistry**

Students study the chemical and biochemical aspects of foods, wine, fibers/polymers, pesticides, and environmental pollution. Research includes basic and applied problems in analytical, organic, physical, inorganic, or biological chemistry. Group research includes pesticide and toxicant chemistry, food/meat/dairy chemistry, fiber and polymer chemistry, and enzymatic reactions and fermentation chemistry.

- **Biological Systems Engineering**

The program stresses the use of engineering to efficiently produce, distribute and process biological products, such as food, feed and fiber, while conserving natural resources, preserving environmental quality, and ensuring the health and safety of people. Programs of study include aquacultural engineering, ecological systems engineering, energy systems engineering, environmental engineering, food engineering, forest and fiber engineering, health and safety engineering, machine systems engineering, postharvest engineering, sensor and control engineering, and soil and water engineering.

- **Cultural Studies**

The Graduate Group in Cultural Studies at UC Davis emphasizes an interdisciplinary approach to research that includes intersectional analyses of class, gender, race, ethnicity, sexuality, nationality, transnationalism, postcolonialism, and related areas of inquiry. The program cuts across the humanities, social sciences, and agricultural and environmental studies and draws faculty from a wide range of disciplines and interests. Students may pursue research in the following areas: 1) gender and masculinity, 2) sexualities, 3) comparative race studies, 4) media and popular cultural representation, 5) science, technology and society, 6) transnational and global studies, 7) religions and communities, 8) rhetoric and critical theory, and 9) disability studies. Or, with the close guidance and supervision of a faculty committee, students may create unique emphasis areas.

- **Materials Science and Engineering**

Study in materials science provides a solid background in advanced materials synthesis, characterization and processing. Research areas include advanced structural materials, materials for biotechnology and medicine, characterization of microstructures, thermochemistry of materials, nanomaterials, glasses and ceramics, high-temperature materials synthesis, interface reactions, advanced coating systems, materials processing, materials testing and strength, optical and electronic/ionic materials, super-plasticity in materials, and advanced coating systems.

Graduate Courses and Student Credit Hours

The following graduate lecture courses are currently offered to graduate students:

- **TXC 230** (3 units): Behavioral Science Concepts in Textiles and Clothing
- **FPS 250 A-F** (3 units): Special Topics in Polymer and Fiber Science

• **TXC 293** (3 units): Recent Advances in Textiles (may be repeated for credit)
 TXC 230 and FPS 250 A-F teach in-depth materials for social and physical science students, respectively, while TXC 293 serves as a bridge to meet needs of students in both areas.

Graduate Student Credit Hours:

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
SCH	247	303	427	344	401	442	565	604	499	NA

Target for Growth and Development

Faculty in the Textiles Graduate group are committed to graduate education and research and have been working to increase student numbers in this program. This can be achieved by increasing faculty members in the group and providing flexible study plans to students. The program currently provides two options. Students in Plan I should complete 30 units of course work (12 units of graduate courses) and a research thesis. Plan II requires 36 units of course work (18 units of graduate courses) plus a final examination. Exploring new funding sources and/or new support mechanisms are key to the health, growth and sustainability of the graduate program.

Career and Professional Advancement of Graduates

From 2000 to 2007, 22 M.S. students and 26 Ph.D. students completed their degrees with the current faculty. The positions include:

Postdoctoral Researchers:

- Cornell University
- Drexel University
- Harvard University
- Johns Hopkins University
- LBL National Laboratory
- University of Sao Paulo
- University of Washington
- University of Wisconsin

Faculty Positions:

- Auburn University
- California State University, Fullerton
- Georgia State University
- Nanjing University of Aeronautics and Aerospace, China
- University of Martinique, Department of Chemistry
- University of Manitoba, Canada

Research Positions in Industry:

- Advanced Medical Optics, Inc. (AMO)
- EMPA, Switzerland
- Invista

TXC Academic Plan

Mervyn's
Nanotex
The North Face
United Air Specialists, Inc.
Vision Service Plan
E-Luxury

Government:

Bureau of Home Furnishing, State of California
Department of Toxic Substance Control, State of California