Program Proposal for a Minor

1. Name of the proposed minor.

Textile Science and Product Performance

2. Name of the department(s) involved.

Apparel, Events, and Hospitality Management (AESHM)

Program: Apparel, Merchandising, and Design (AMD)

3. Name of contact person(s).

Chunhui Xiang, Ph.D.; Assistant Professor
Gouwen Song, Ph.D., Associate Professor, Noma Scott Lloyd Chair
Eulanda Sanders, Ph.D.; Professor and Donna R. Danielson Professor in Textiles & Clothing
Christine Leiran Wise, M.S.; M.B.A.; Academic Advisor

4. General description of the minor.

The proposed Textile Science and Product Performance minor consists of 17 credits, including 14 credits distributed over four required classes. Six of the nine required 300-400 level credits in the minor must be taken at Iowa State University. Nine credits must be isolated to the minor only.

Textile Science and Product Performance minor (17 credits)

A M D 204: Textile Science (3-2). Cr. 4. F. S. Prereq: A M D 131.

Textile fibers, yarns, fabrication, coloration, and finishes. Quality and performance application to consumer soft goods and technical textiles. Online component.

A M D 231: Product Development and Manufacturing (3-2). Cr. 4. F.S. Prereq: A M D 204

Analysis of apparel product development, sourcing, and manufacturing processes. Focus on materials and specifications relative to quality, performance, cost, and price. Applications of software for PLM.

A M D 305: Quality Assurance of Textiles and Apparel (Dual-listed with A M D 505). (2-2) Cr. 3. F. Prereq:A M D 231, one course in natural science; STAT 101, STAT 104, or STAT 401.
Principles of product and materials evaluation and quality assurance. Developing specifications and using standard practices for evaluating materials, product characteristics, performance, and quality.

A M D 404: Advanced Textile Science (Dual-listed with A M D 504). (2-2) Cr. 3. S. Prereq: A M D 204, CHEM 163/CHEM 163L. Theories and principles of textile science. Emphasis on fiber structure on fabric properties and performance; new developments in textiles.

Select one course for 3 credits from: AESHM 470N Supervised Professional Internship, A M D 490 Independent Study, A M D 499 Undergraduate Research

The proposed minor has the following caveats:

- The three elective credits in the minor may come from an approved textile industry internship, a textiles focused independent study, or a textile focused undergraduate research study.
- Student pursuing this minor will have a buried prerequisite for AMD 404 of a college level chemistry course with a lab. Students will not be held to the prerequisite of AMD 131 for AMD 204.
- Students in the Apparel, Merchandising, and Design major could declare the minor if their primary options are design or merchandising; product development students will not be eligible for the minor due to the overlap in classes.

The minor is designed for 1) students in the STEM fields of Chemistry, Chemical and Biological Engineering, and Materials Science and Engineering who desire academic experiences and knowledge in another applied product area, and 2) students in the apparel design and merchandising areas who want a focused concentration on textile science and the evaluation of quality and performance of textiles and textile products.

5. Need for the proposed minor.

In 2015, the global textile and garment industry was estimated at a worth of nearly $3,000 trillion (http://www.business2community.com). The use of textiles in everyday life encompass uses in: (a) medical procedures, (b) shelters and homes, (c) transportation, (d) physical and psychological protection, (e) physical performance, (f) adornment. Students at ISU have recognized the importance of understanding textiles as an essential component of many products and businesses. As a result, non-major enrollment in AMD 204 Textile Science has increased in recent semesters to include students from Chemistry, Chemical and Biological Engineering, Family and Consumer Sciences Education, Materials Science and Engineering, and Industrial Design. Many of these non-majors are involved in research and independent studies with AMD tenured and tenure eligible faculty. A minor targeted specifically at the scientific, innovative, evaluative, technological, and performative aspects of textiles will fulfill industry demands for graduates, in a range of disciplines, that can provide answers to complex, interdisciplinary issues linked to textile centered products.

6. Objectives of the proposed minor including the student learning outcomes and how the learning outcomes will be assessed.

Students who complete the Textile Science and Product Performance minor will not only meet the learning outcomes of each course in the minor, will meet the following two over-arching learning objectives:

- Apply a comprehensive understanding of the characteristics (physical, chemical and structural) of textiles/textile products and the interrelationship of these characteristics to their major discipline.
- Engage in interdisciplinary research through the analysis, testing and evaluation of textiles and textile products for sustainable industry and global applications in their major.

Evaluation of student learning as related to objectives will be based on performance on quizzes, exams, activities, projects, lab assignments and notebooks, presentations, class participation, papers, assessment of independent learning, and evaluation of research results.

Objectives of Textile Science and Product Performance Minor Required Courses

AMD 204: Textile Science
Fall 2016
Course Objectives
Upon completion, students enrolled in AMD 204 will be expected to:

1. Gain a comprehensive vocabulary of textile terms.
2. Apply knowledge of fibers, yarns, fabric construction, and finishes to determine the quality and serviceability of fabrics in relation to end uses.
3. Understand properties of fibers to their chemical structure and chemical properties.
4. Identify fibers by generic names, trade names and chemical structure.
5. Identify types of yarns and their characteristics; relate yarn characteristics to scientific principles as a means of explaining performance.
6. Identify fabrics by construction methods/structures and relate construction methods to fabric characteristics and to scientific principles as a means of explaining performance and serviceability.
7. Identify fabric finishes as they relate to aesthetics and fabric performance.
8. Identify, operate and comprehend the purpose of standard laboratory equipment used for textile identification and testing.
9. Analyze and predict fabric performance and serviceability based on fiber contents, yarn structure, construction method/structure and finish.
10. Synthesize basic textile specifications for specific end uses and relate specifications to scientific explanations for predicting performance.
11. Apply comprehension of textile legislation, laws, and labeling requirements.

AMD 231: Product Development and Manufacturing
Fall 2016
Course Objectives

1. Gain insight into the apparel industry through examining the organization and structure of the textile/apparel industry; acquiring terminology, and analyzing various categories of apparel.
2. Indicate the role and requirements of sourcing in a global environment.
3. Display an understanding of the relationship between product standards and specifications and their use among vendors, manufacturers, contractors, retailers, and consumers.
4. Develop specifications for fit, materials, and product assembly.
5. Identify stitch and seam classifications, characteristics, and appropriate uses regarding production costs, product performance and quality as based on ASTM Standard 9263.

6. Analyze the functions, characteristics, and applications of fabric, support materials, closures, thread, and trims relative to quality, cost, and performance of apparel.
7. Evaluate apparel manufacturing processes relative to product cost, quality, performance, social responsibility and environmental sustainability, and make product development related decisions based on logical reasoning.
8. Demonstrate an understanding of the relationship among preproduction operations: cut order planning, marker making, spreading, and cutting and factors affecting quality, costs, and productivity.
9. Exhibit an understanding of the fundamental principles of equipment operation and use in cutting, sewing, and pressing, and the effects of advanced technology on productivity, quality, cost, and justification of purchase.
10. Communicate technical information effectively with others in one-on-one, small group, and large group situations through oral, written and visual communication.

AMD 305: Quality Assurance of Textiles & Apparel
Fall 2016
Course Objectives

1. Integrate textile testing and quality assurance.
   a. Understand the purposes and limitations of textile testing and quality assurance.
   b. Know these textile testing and quality assurance organizations, their purposes and philosophies (AATCC, ASTM, ASQ, NIST, and ISO).
   c. Understand the differences between laboratory and wear testing.
   d. Understand the importance of working in a standard environment.
2. Write specifications for textile materials and textile products.
   a. Establish specifications based on target markets for material and product characteristics and performance, and product assembly and appearance.
   b. Determine appropriate tolerances based on quality and cost standards.
   c. Determine zone levels for products.
   d. Establish an AQL (Acceptable Quality Level) for a product.
3. Conduct a complete quality assurance audit.
   a. Determine a regular, tightened, or relaxed sampling plan for an assortment/production lot.
   b. Select random samples based on test method or sampling plan requirements.
   c. Locate and follow a standard test method.
   d. Operate equipment safely, accurately, and precisely.
   e. Evaluate products for conformance to standards and specifications.
   f. Categorize defects as critical, major, or minor.
   g. Evaluate a sample lot for adherence to quality specifications and standards.
4. Be an effective and productive team member.
   a. Communicate effectively with team members.
   b. Meet team deadlines and standards for performance.
5. Interpret results of a quality assurance audit.
   a. Solve specific problems or complaints regarding products or materials.
   b. Define quality for a specific textile product.

c. Explain performance expectations for a product or material.
d. Relate results of a quality assurance audit and testing to product claims, care labels, company standards, and company specs.
e. Use results of a quality assurance audit to accept/reject a product lot.

AMD 404: Advanced Textile Science
Spring 2017
Course Objectives

1. Demonstrate understanding of uses of textiles in apparel, furnishings and other soft good products
2. Analyze and predict serviceability, performance, and end use of fabrics based on fiber content, yarn structures, construction methods, and finish characteristics, including color to select appropriate textiles to meet the needs specified.
3. Summarize current literature and trends in textiles.
4. Recognize and describe the relationships between fiber properties, structure and performance.
5. Critique specific properties that define serviceability and textile performance.
6. Critically compare and contrast the serviceability factors of comfort, cost, aesthetics, and performance attributes of textile and apparel products.
7. Evaluate the relationship among textile materials, textile products, the user and the environment in which the product is used.
8. Apply textile science knowledge to understand the properties of textile products and end uses

7. Relationship of the minor to other programs at Iowa State University.

The AMD general minor consists of 16-17 credits selected from a broad base of courses in merchandising, design, product development, textiles, history, cultural and consumer studies. The AMD general minor consists of a one course selection from four introductory courses (AMD 131, AMD 165, AMD 121, or AMD 178); the required AMD 204 Textile Science; a one course selection from four 200 level courses (AMD 231, AMD 245, AMD 257, AMD 275); and a final selection of 6 credits from select AMD or approved AESHM courses numbered 300-400 at Iowa State.

The Textile Science and Product Performance minor will total 17 credits and will share one required class from the AMD general minor: AMD 204 Textile Science. All other courses specific to the Textile Science minor were featured on "select from" lists and not required; AMD 231 Product Development and Manufacturing, AMD 305 Quality Assurance, AMD 404 Advanced Textile Science, and one course from AESHM 470N Professional Supervised Experience, AMD 490 Independent Study, and AMD 499 Undergraduate Research.

The minor is larger than the Materials Science and Engineering specialization area, which consists of 300-400 level coursework levels from ceramic, metallic, or polymeric materials.

8. Relationship of the minor to the strategic plans of the university, of the college, and of department or program.

Offering the Textile Science and Product Performance minor is timely and aligns with the campus initiatives focusing on interdisciplinary collaboration and innovation. The ISU 2017-2022 Strategic Plan posits that our students "…are tomorrow's leaders and problem solvers…"

Consequently, our Textile Science and Product Development minor will engage a range of students in "…basic and applied research to improve lives and sustain the planet" (ISU 2017-2022 Strategic Plan). The Apparel, Merchandising and Design's programmatic mission is to "Provide integrated yet customized education and scholarship to optimize apparel and related products, services, and experiences." Therefore the proposed minor offers options for students outside of the AMD program who need textile material knowledge to address complex global problems in their respective academic programs.

AMD has two endowed professorships, which have impacted curricular development the past few years. First, the Noma Scott Lloyd Chair in Apparel, Merchandising, and Design position funded lab equipment and support funding for research in textile science, performance testing, and new product/finish development. As a result of the endowed chair, two new textile science labs have been developed and furnished. One lab and one teaching lab were already in existence at the time. The Noma Scott Lloyd Chair has attracted graduate students to study and perform research in the textile science area.

Second, the Donna R. Danielson Professor in Textiles and Clothing has collaborated with undergraduates, graduate students and faculty across campus to establish research teams addressing: (a) the integration of solar technologies into textile products to create "smart" textile products, (b) colorfastness problems digital textile printing and other dye applications, and (c) optimal settings for laser cutting/etching a variety of textile products to increase socially responsible practices. These projects have attracted undergraduate students from the STEM discipline at ISU; however, the Textile Science and Product Performance minor will allow learning/research opportunities and access to more students.

As part of ISU's vision to "…lead the world in advancing the land-grant ideals of putting science, technology, and human creativity to work" (ISU 2017-2022 Strategic Plan), the university is building a Student Innovation Center (SIC) to foster interdisciplinary student learning opportunities. The goal of this new building is to: "be a destination that inspires students to innovate through experimentation, interdisciplinary collaboration, and free exchange of ideas in an inclusive environment" (SIC Steering Committee). The Donna R. Danielson Professor in Textiles and Clothing is a member of the steering committee for this building. The proposed Textile Science and Product Performance minor sets the stage to actualize this goal, prior to the opening of the SIC.

The textbook *Textiles* is currently in its 12th edition, most recently revised and published in 2016. Two Iowa State University faculty, Dr. Sara Kadolph, Professor Emeritis, and Dr. Sara Marcketti, Professor. Latest figures from the publisher, Pearson is that the book is adopted by faculty in 180 institutions, has been translated into Korean and Chinese, and is used within the apparel industry as a reference book.

9. Comparison of the proposed minor with similar programs at other universities, including the Regent's universities.

A Textile Science minor is not offered at the University of Northern Iowa through the Textile and Apparel Program (TAAP) or University of Iowa. Textile Science majors exist at University of Nebraska-Lincoln, Cornell University, Clemson University, and North Carolina State.

10. Program requirements and procedures, including:

a. **Prerequisites for prospective students;** Students would be held to a prerequisite of Chem 163/163L or Chem 177/177L or an equivalent lecture/lab combination to enroll

in the required AMD 404 Advanced Textile Science course. Students will be held to a textile science course with a lab if the student is transferring a textile science course into ISU.

b. **Application and selection process;** Students would apply for the minor by meeting with an adviser in AMD and completing the paperwork "Request for a Minor".

c. **Language requirements;** Students are not held to a language requirement.

d. **Courses and seminars presently available for credit toward the program;** AMD 204 Textile Science, AMD 231 Product Development and Manufacturing, AMD 305 Quality Assurance, AMD 404 Advanced Textile Science, AESHM 470N Professional Internship, AMD 490 Independent Study, and AMD 499 Undergraduate Research.

e. **Proposed new courses or modifications of existing courses;** AMD 400/500 Dual Listed Course to be developed by Dr. Song.

f. **Advising of students;** AMD Lead Adviser would complete the "Request for Minor" paperwork with student, check for completion of prerequisite, inform student of sequences, and inform student of fall and spring only offerings. Students interested in a professional internship should confer with the AMD Internship Coordinator in addition to Textile Science faculty. Students interested in an independent study or undergraduate research should confer with Dr. Song, Dr. Xiang, or Dr. Sanders.

g. **Implications for related areas within the university.** Students likely to declare the minor will come from programs where chemistry classes are required or among the science choices encouraged: Chemistry, Materials Science and Engineering, Chemical and Biological Engineering, and Industrial Design. Apparel, Merchandising, and Design majors specializing in the Design primary option and Merchandising primary option could declare the Textile Science minor. Students in AMD declaring the Product Development primary option would not be eligible for the minor due to the overlap in required classes. All students in the AMD major will be advised that any AMD double dipped into the AMD major and the Textile Science and Product Performance minor must meet the grade of C- for AMD courses in the major.

11. General description of the resources currently available and future resource needs, in terms of:

a. **Faculty members:**

Guowen Song, Ph.D.
Associate Professor
Noma Scott Lloyd Chair in Apparel, Merchandising, and Design
Contact Information:
Office: 1064 Lebaron 626 Morrill Rd, Ames, IA 50011
Phone number: +1 515 294 3012
Email: gwsong@iastate.edu

Teaching and Research Interests: 1) Analysis of textile material and clothing performance for comfort and function, 2) Modeling studies of textile materials and protective clothing, 3) Development of devices and test protocols used in textile material and clothing evaluation, 4) Application of instrumented (flash fire, hot liquid, and sweating) manikins and 3D body scanning technology for clothing performance studies, 5) Novel textile material development for protective clothing

Chunhui Xiang, Ph.D.
Assistant Professor
Contact Information:
Office: 1084b Lebaron 626 Morrill Rd, Ames, IA 50011
Phone: +1 515 294 7515
Email: chxiang@iastate.edu

Teaching and Research Interest: 1) Modification of the properties of existing textile products with nanomaterials, i.e. nanofibers, nanopartiles. 2) Development of novel nonwoven fabrics from nanofibers and nanocomposites electrospun from renewable and biodegradable polymers. 3) Investigation of the performance behavior of the nanomaterial modified textile products to meet the textile target market. Dr. Xiang serves on the ISU interdepartmental research team studying biopolymers and biocomposites**.** Teaching interest includes Textile Science, Advanced Textile Science, and Quality Assurance.

Brenda Ackerman, M.S.
Senior Lecturer
Contact Information:
Office: 1084c Lebaron 626 Morrill Rd, Ames, IA 50011
Phone: +1 515 294 7549
Email: bpacker@iastate.edu

Teaching and Research Interest: Teaching interest includes Product Development and Manufacturing, Technical Design Processes, Apparel Manufacturing and Engineering, Patternmaking: Flat Pattern, Draping, and Drafting.

Eulanda A. Sanders, Ph.D.
Professor
Donna R. Danielson Professor in Textiles and Clothing
Contact Information:
Office: 1052 Lebaron 626 Morrill Rd, Ames, IA 50011
Phone: +1 515 294 7857
Email: sanderse@iastate.edu

Teaching and Research Interests: Apparel Design and Product Development, Integration of Solar Technologies into Textile and Apparel Goods, Colorfastness Properties of Digital Textile Prints and Dyed Textiles, Optimizing Laser Cutting and Etching of Textile Goods.

b. Computers, laboratories, and other facilities:

- Quality Assurance and Textile Science Lab (1059 LeBaron)
- Textile Science and Technology Lab (1078 LeBaron)
- Textile Science Lab (2094 LeBaron – newly completed)

- Digital Apparel and Textile Studio – DATS (1052 LeBaron)
- Apparel Design and Product Development Lab (2092 LeBaron)
- Computer Labs (113 and 108 MacKay Hall)

c. Library facilities (journals, documents, etc.) in the proposed area:

Textile Research Journal (Online), *Journal of the Textile Institute* (2004 : Online), *Journal of Textile and Apparel Technology and Management JTATM* / NC State University, *Textile World*, *Clothing and Textile Research Journal*, Proceedings of the American Association of Textile Chemists and Colorists International Conferences

d. Supplies, field work, student recruitment, etc.:

Recruitment of undergraduate students in the form of communication to advisers in various areas of interest, flyers and posters in relevant buildings housing interested majors.

12. Describe the needs for new resources and/or reallocated resources. Attach to the program proposal memos from the department chair(s), the college dean(s), and other appropriate persons, agreeing to the allocation of new resources and/or the reallocation of resources.

The Textile Science and Product Performance minor will not require additional funding for new resources or a reallocation of resources.

13. Attach to the program proposal, letters of support, recommendations, and statements when appropriate, from programs and departments at ISU which are associated with the proposed program or have an interest in the proposed program.

Letters from the following are attached to this file:

- Apparel, Merchandising, and Design – Dr. Robert Bosselman, Chair
- Materials Science and Engineering – Dr. Kristin Constant, Chair
- Industrial Design, David Ringholz, Chair

14. If the new program is interdisciplinary, a governance document should be created and submitted to the Associate Provost for Academic Programs. Indicate here that it has been completed.

New minor is not interdisciplinary.

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

College of Human Sciences
Department of Apparel, Events,
and Hospitality Management
31 MacKay Hall
Ames, Iowa 50011-1121
515 294-7474
FAX 515 294-6364
e-mail aeshm@iastate.edu

Date: November 10, 2016

To: Faculty Senate Curriculum Committee

From: Dr. Robert H. Bosselman, Chair

Subject: Support for Minor Proposal

As Chair of the Department of Apparel, Events, and Hospitality Management (AESHM), I write to support the proposal for a minor in Textile Science and Product Performance in the Apparel, Merchandising, and Design Program (AMD). Drs. Chunhui Xiang, Guowen Song, Eulanda Sanders and Lead Advisor Chris Wise have provided a thorough rationale for the proposed minor. The minor builds upon STEM-related work in the AMD Program, and offers opportunities for students in related fields, such as chemistry and engineering. The minor enhances STEM opportunities for students.

With the continued growth and globalization of the textile industry, qualified professionals will be in high demand. There are few programs competing for students in this genre of textile sciences. The proposed minor supports efforts within AESHM to provide learning opportunities for a broad base of students in the university. Given the faculty involved with the proposal, an added benefit of the minor will be increased opportunities for students to collaborate on research projects. There are adequate labs within AMD to handle the additional students from the minor.

AMD is already recognized as a leading program within the apparel and textile field. This proposal builds upon existing program strength to open up new opportunities for students interested in textile sciences and product performance. The role of apparel and textiles in everyday human life is changing, and this minor is presented as an opportunity to demonstrate our AMD Program is leading the field.

This proposal has my full support and recommendation for approval.

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

College of Engineering
Materials Science & Engineering
2240 Hoover Hall
Ames, IA 50011-2300
Phone: 515 / 294-4722
FAX: 515 / 294-5444
genalo@iastate.edu

November 14, 2016

Letter of Endorsement for the Textile Science and Product Performance Minor:

To Whom It May Concern;

The Materials Science and Engineering Department's Curriculum Committee has reviewed the Textile Science and Product Performance Minor being proposed by the AMD Program. Several of our Mat E majors have taken the existing AMD minor and we believe others will be interested in this newly proposed minor. A number of our students have taken AMD courses as electives and we believe this will continue as well. In fact, this morning I signed a form showing that one of our Mat E students is declaring a second major in AMD. We appreciate any effort to broaden the available offerings that interest our students and endorse the offering of this minor.

Sincerely,

Lawrence J. Genalo

Lawrence J. Genalo
Fellow of the American Society for Engineering Education
University Professor and Associate Chair
MSE Department Curriculum Committee Chair

Endorsed by

Kristen P Constant

Kristen P. Constant
Morrill Professor
Wilkinson Professor of Interdisciplinary Engineering and Chair

IOWA STATE UNIVERSITY

Department of Industrial Design
146 College of Design
715 Bissell Road
Ames, Iowa 50011-1066
P 515 294-2557 F 515-294-2348
http://www.design.iastate.edu

DATE: November 15, 2016

TO: Faculty Senate Curriculum Committee

FROM: David Ringholz, Chair

SUBJECT: Support for Minor Proposal

I enthusiastically support the proposed minor in Textile Science and Product Performance offered by the Apparel, Merchandising and Design Program (AMD). The minor is thoughtfully structured and addresses key objectives that occupy a unique space. The proposed coursework seeks to address the need for interdisciplinary experiences that will attract students from the Sciences, Engineering and Design.

The Industrial Design Department (INDD) is specifically interested in expanded opportunities to formalize its relationship with the AMD program. AMD and INDD students continually work together on project-based coursework and this proposed minor gives additional pathways for exploration and depth in Textile Science and Product Performance. For INDD, the subject matter is highly relevant and the minor structure is a useful and desirable package. I anticipate that there will several INDD students interested in applying this minor to their concentration requirements.

I fully support this proposal and recommend it for approval.

Voting Record for AMD Minor in Textile Science and Product Development

(9/26/16) AMD Faculty 17-0-0 (100%-0%-0%)

(10/3/16) AESHM Curriculum Committee 8-0-0 (100%-0%-0%)

(10/10/16) AESHM Faculty 26-0-0 (100%-0%-0%)

(November 2016) CHS Faculty 83-1-5 (93%-1%-6%)