

Textile Technology and Textile Chemistry

Faculty and Fields of Interest

Calvert, Paul (Chairperson Department of Materials and Textiles) Professor of Materials and Textiles (2003), BA 1967 Cambridge University, PhD 1971 Massachusetts Institute of Technology. *Specializations:* Materials science, polymer and ceramic structure/property relations, biomaterials, nonconventional ink jet printing.

Fan, Qingou Associate Professor of Materials and Textiles (1998), BS 1982, MS 1988 China Textile University, PhD 1995 University of Leeds. *Specializations:* Textile chemistry, dyeing and finishing, chemical analysis, organic synthesis.

Kim, Yong Ku (Graduate Program Director) Chancellor Professor of Materials and Textiles (1981), BS 1970, MS 1974 Seoul National University, Korea, PhD 1980 North Carolina State University. *Specializations:* Fiber/polymer physics, composite materials, structural mechanics of fibrous structures, medical textiles, digital printing and color physics.

Langley, Kenneth Chancellor Professor of Materials and Textiles (1968), BS 1964 Southeastern Massachusetts Technological Institute (UMass Dartmouth), MS 1968 Institute of Textile Technology. *Specializations:* Microscopy and statistics, yarn manufacturing.

Ugbolue, Samuel C Lecturer in Materials and Textiles (1998), Ctext 1968 Blackburn College of Technology and Design, MSc 1971, PhD 1974 University of Strathclyde. *Specializations:* Polymer and fiber science, yarn manufacture, textile evaluation, clothing engineering.

Warner, Steven Professor of Materials and Textiles (1994), SB 1973, SM 1973, ScD 1976 Massachusetts Institute of Technology. *Specializations:* Fibers, composites, non-wovens, microscopy, wicking, and wetting.

Graduate Textile Technology/Textile Chemistry at UMass Dartmouth

Department of Materials and Textiles College of Engineering

The objectives of the Master of Science degrees in Textile Technology and Textile Chemistry are

- To supply graduates qualified to assume leadership roles in the textile industry
- To provide a sound education essential to developing the student's ability to initiate and conduct independent investigations.
- To develop a comprehensive understanding of the student's major area of interest through course work, independent study, and a thesis endeavor that ensures the student has developed a logical and creative mind.

Graduate studies in textile technology provide advanced studies in the science and technology of fibrous materials, the conversion of these into related structures and, as well, their chemical and physical performance. Students of textile chemistry study advanced applications of chemistry to the coloration and alteration of the functional properties of textile structures. Both programs address fundamental science and technology and, as well, the applicable technology of manufacturing. We encourage our students to participate in our extensive internship program.

The Materials and Textiles building has large laboratory spaces devoted to research and education, with equipment for the processing of yarn from the raw material and the conversion of these yarns into various textile structures from wovens and knits to composites and specialty products. Equipment is also available for dyeing small lots of fibers, yarns, and fabrics both atmospherically and under pressure; applying various chemical finishes; experimenting with wet finishing operations, and evaluating performance properties during all processing stages. Textiles graduate students have done research and development work in many industry settings in the area as well as in the on-campus Advanced Technology and Manufacturing Center.

UMass Dartmouth has joined five different universities in membership in the National Textile Center. This Center has awarded at least a \$500,000 grant for each of the past four years, to support textile research projects by the Department of Materials and Textiles. The grant funds research and provides stipends for graduate student assistantships.

Admission Requirements

Applicants must submit the required application materials to the Graduate Office. In addition, the following considerations apply:

- The Graduate Record Exam (GRE) is required of all applicants.
- Applicants are further required to submit a comprehensive statement of educational objectives and goals, which would accompany the student's application.
- Each applicant will be examined in light of his or her academic record as well as specific work experience.

Candidates for Textiles graduate programs will have completed BS degrees in Materials and Textiles, Textile Engineering, Textile Technology, or other engineering or applied science and technology fields. Successful applicants with degrees in other disciplines may be required to undertake foundation courses prior to advancement to candidacy for a degree in Materials and Textiles. The foundation courses required will be determined in accordance with the student's background, interests, and goals.

Financial Assistance

A number of assistantships are available on a competitive basis. Indicate your interest on the admissions application form. The department offers research assistantships associated with a variety of research grants and contracts, including projects sponsored by the National Textile Center.

Other assistance, such as loans or work-study, may be available to you. In addition, graduate students in both Textile Technology and Textile Chemistry at UMass Dartmouth who come from Connecticut, Maine, New Hampshire, Rhode Island, or Vermont qualify under the New England Regional Student Program for a significant reduction in out-of-state tuition. For information on both aspects, please refer to the chapter on "Expenses and Financial Assistance."

Degree Requirements in Textile Technology (MS degree)

The student is required to complete 30 graduate credits of study. There is no foreign language requirement. The program will normally require two years of study.

Fall Semester I

TET 503 one credit
Research Techniques
TET 563 three credits
Fibrous Structure
TET Elective three credits
Graduate course in textile technology
Elective three credits
Appropriate 400, 500, or 600 level course
in a Textiles-related field

Total: 10 credits

Fall Semester II

TET 504 three credits
Graduate Seminar
TET 500 eight credits
Thesis

Total: 11 credits

Spring Semester I

TET 508 three credits
Design and Analysis of Experiments
TET Elective three credits
Graduate course in textile technology
Elective three credits
Appropriate 400, 500, or 600 level course
in a Textiles-related field

Total: 9 credits

Spring Semester II

Continue with thesis research and writing

Total Program Credits: 30

Degree Requirements in Textile Chemistry (MS degree)

The student is required to complete 30 graduate credits of study. There is no foreign language requirement. The program will normally require two years of study.

Fall Semester I

TET 503 one credit
Research Techniques
TEC 502 three credits
Physical Chemistry of Dyeing
TEC 509 three credits
Chemical Techniques of Finishing
Elective three credits
Appropriate 400, 500, or 600 level course
in a textiles-related field

Total: 10 credits

Fall Semester II

TET 504 three credits
Graduate Seminar
TEC 500 eight credits
Thesis

Total: 11 credits

Spring Semester I

TET 508 three credits
Design and analysis of Experiments
TEC 510 three credits
Polymer Chemistry
TEC 533 three credits
Computer Color Matching

Total: 9 credits

Spring Semester II

Continue with thesis research and writing

Total Program Credits: 30

Thesis — Both Degrees

Every student will do a master's thesis. The thesis requirement may be fulfilled in the textile sciences or may be of an interdisciplinary nature. In the latter instance, however, the emphasis must be on some aspect of either textile chemistry or textile technology, depending on the student's chosen program. Students with an undergraduate specialty in an area other than textiles have the opportunity to couple this knowledge with textiles in either a scientific, theoretical, or more applied project. The student should meet at the earliest possible date after the start of studies with the Materials and Textiles Graduate Program Director to discuss his or her interests regarding thesis study. At that time, the student will be assigned a thesis committee of faculty whose background is compatible with the student's area of interest. The student will also receive a copy of the outline for a thesis proposal.

Upon the completion of a thesis proposal, the Committee will meet with the student to finalize the proposed work. The proposal should be made available to the Committee members at least one week prior to the scheduled meeting.

Each committee member should be provided with a draft copy of the completed thesis, no later than two calendar months prior to the scheduled graduation date. An oral examination in defense of the thesis is required to be given before the Committee at least six weeks prior to graduation. At this time, the rough-draft copies, comments and corrections having been made, will be returned from each committee member.

The approved thesis must be available at least three weeks prior to graduation. In addition to the two copies prepared for deposit in the University of Massachusetts Dartmouth library, two bound copies will be given respectively to the student's main advisor and the Department of Materials and Textiles.

Contact

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Textile Chemistry Courses

Materials and Textiles

TEC 500 eight credits

Thesis

Written presentation of an original research topic in Textile Chemistry, which demonstrates analysis, ability, and proficiency in the solution. The thesis shall be conducted under the supervision of a faculty advisor. An oral examination in defense of the thesis is required. Graded CR/F.

TEC 501 four credits

Chemistry of Dyestuffs

This course deals with the chemistry and technology of dyestuffs. The raw materials, intermediates and finished dyestuffs are studied in detail. The effect of the constitution on color and fastness properties is emphasized. Theoretical as well as practical, economic, and ecological points of view are presented. The preparation of typical intermediates and dyestuffs is carried out in the laboratory.

TEC 502 three credits

Physical Chemistry of Dyeing

This is a lecture course concerned with the physicochemical theories of the application of dyestuffs to textile and related materials, including the thermodynamics and kinetic principles involved.

TEC 503 three credits

Physical Chemistry of Surface Active Agents

This lecture course is concerned with the physicochemical principles involved in surface-active agents. The chemical nature of the agents is studied and related to their properties. The technical uses are evaluated on this basis.

TEC 508 three credits

Advanced Textile Printing

Prerequisite: TEC 411

The more complex styles of printing, discharge and resist, are covered in detail. The preparation of white and colored print paste for all classes of dyed backgrounds is investigated. Attention is given in dyeing ground shades for discharge printing. Special effects such as Plisse, Burn-out and Vigoreaux styles are considered.

TEC 509 three credits

Chemical Technology of Finishing

This course is more comprehensive than that given in the undergraduate course. Greater detail is provided concerning the mechanisms used in the application of specialized finishes and the chemical reactions involved.

TEC 510 three credits

Polymer Chemistry

The physical and organic chemistry of monomers and polymers, including a consideration of bonding forces, spectroscopic methods of structure determination, structure and property correlations, fractionation, thermodynamics, and methods of molecular weight determination for polymers in solution; the kinetics of condensation and additional polymerization as applied to polymers and copolymers, mechanism of free radical and ionic polymerization, stereospecific polymers, the chemistry of the more common polymer systems, and preparation of their corresponding monomers.

TEC 521 three credits

Textile Chemistry I

The mechanics of dyeing, printing, and finishing. The structures of dyes and textile fibers, detergency and scouring, and dyeing equipment and procedures.

TEC 522 three credits

Textile Chemistry II

The principles involved in the application and printing of dyes and pigments on textile materials. Topics include textile finishing and functional requirements of permanent press, softness, water repellancy, and fire retardance.

TEC 525 three credits

Fiber Materials

The structure and production of fibers, including molecular arrangements and morphologies. The conversion of fibers into textile yarn structures and the relationship between physical and chemical properties of fibers and processing dynamics on the yarn properties will be studied.

TEC 533 three credits

Computer Color Matching

Prerequisite: Graduate standing in textiles
A complete discussion of color science and computer match prediction in dyeing fibers, yarns, and fabrics. Objective specification of color, color difference, measurements, and various color spaces are introduced. Based on color theory and numerical analysis, computer match prediction algorithms are discussed. Practical fiber/dye data files are created and used to reproduce dyed samples with the match prediction software in accompanying computer color matching labs.

TEC 595

Independent Study

Prerequisites: Permission of instructor,

graduate director, and college dean
Study under the supervision of a faculty member in an area not otherwise part of the discipline's course offerings. Conditions and hours to be arranged.

TEC 596 three credits

Directed Study

Prerequisites: Permission of the instructor, graduate director, and college dean
Study under the supervision of a faculty member in an area covered in a regular course not currently being offered. Conditions and hours to be arranged.

Textile Technology Courses

TET 500 eight credits

Thesis

Written presentation of an original research topic in Textile Technology, which demonstrates analysis, ability, and proficiency in the solution. The thesis shall be conducted under the supervision of a faculty advisor. An oral examination in defense of the thesis is required. Graded CR/F.

TET 501 three credits

Yarn Technology

Prerequisite: TET 511

Aspects of yarn processing which affect the properties of the product during the various stages of manufacturing. Extensive use of reference materials is required in completion of written reports on subject matter assigned. To familiarize the student with research procedures and the evaluation of results, actual project reports will be studied.

TET 503 one credit

Research Techniques

Aids the student in better understanding research approach and techniques. To develop an insight as to the evaluation of research results. A proposal on an original research topic must be submitted and approved.

TET 504 three credits

Graduate Seminar

Student discussions on selected topics will be carried out under the supervision of a faculty member. Written papers to be submitted on those topics assigned.

TET 506 three credits

Independent Study

Prerequisite: graduate standing

Individual study under the supervision of a faculty member in an area of textiles not otherwise a part of the course offerings. Students shall be held responsible for meeting the requirements of independent study as outlined in an approved proposal.

TET 507 three credits

Textile Microscopy and Photomicrography

Prerequisite: TET 462

The use of the microscope in relation to fiber identification and structure, composition of blends, physical, chemical, and biological condition of yarns and fabrics. Recording of data by photomicrography is included.

TET 508 three credits

Design and Analysis of Experiments

Prerequisites: TET 411, TET 412

A study of the statistical methods and systems employed in the design of experiments, the

testing of materials, and the evaluation of test data.

TET 517 three credits

Fiber Reinforced Polymeric Materials

2 hours lecture, 3 hours laboratory

Prerequisite: Graduate or senior standing

An introduction to advanced composite materials employing fiber reinforcement. Also studied are resins for polymeric matrices, reinforcing fibers, and properties of the resulting structures. Manufacturing techniques and testing of composite materials are examined.

TET 522 three credits

Statistical Methods of Quality Control

Prerequisite: TET 521

Continuation of TET 521.

TET 526 three credits

Textile Manufacturing Processes

The conversion of fibers and yarns into fabric structures by weaving and nonwoven processes. Also studied are the interaction of material, design, and processing conditions on the quality of fabric and fabric structures as they relate to dyeing and finishing applications.

TET 563 three credits

Fibrous Structure

The molecular structure and arrangements of molecules in fibers are considered with respect to giving a foundation to the understanding of the physical and mechanical properties and behavior of textile raw materials. The properties are examined from a fundamental viewpoint so that a sound approach to the technological utilization of fibers in textiles can be established. An introduction is made to the interrelation between fiber properties and yarn and fabric geometry in determining the behavior of textiles.

TET 564 three credits

Mechanics of Fibrous Structures

A study of the mechanics of fibrous assemblies such as twisted structures (yarns, rope, braid), woven, knitted, and non-woven fabrics. The methods of continuum mechanics and differential geometry to interrelate material properties and end-use properties are considered.

TET 594 three credits

Special Topics in Materials

Covers one or more new areas in materials and textiles, such as nanotechnology, biotechnology, soft electronics, or smart textiles.

Note: Graduate Textile Technology and Textile Chemistry courses (500-level) are open only to students with graduate standing or to senior undergraduates with the permission of the instructor.

TET 595 variable credit

Independent Study

Prerequisites: Permission of instructor, graduate director, and college dean

Study under the supervision of a faculty member in an area not otherwise part of the discipline's course offerings. Conditions and hours to be arranged.

TET 596 three credits

Directed Study

Prerequisites: Permission of the instructor, graduate director, and college dean

Study under the supervision of a faculty member in an area covered in a regular course not currently being offered. Conditions and hours to be arranged.