
Materials and Textiles

Materials are “stuff.” Metals, ceramics, glasses, plastics, and wood are familiar materials, but we should also pay attention to softer materials like cosmetics, food, our own tissues, and fabrics. Much of the challenge of the immediate future is to bring the soft human world and the hard artificial world closer. Textiles are so familiar as clothing, carpets, and draperies that we tend to forget what special combinations of softness and strength can be achieved by combining fibers. Fibrous structures are the basis for most animal and plant tissues, for the high performance composites that are steadily replacing metals and for many industrial cables, belts, and tires. In addition there are rapid developments in smart textiles with electronic functions and in soft electronics. As conventional labor-intensive textile manufacturing becomes a global enterprise, we can see an increasing focus here in Massachusetts on the development and design of new fibers, new materials, and new applications. The business is technology; but PhDs alone can't run a company. The business needs scientists, engineers, quality control, marketing, management, and all forms of support, but with a technical edge of innovation.

Many traditional materials departments are predominantly devoted to hard materials, metals, ceramics, and glasses. Coming from textiles we have a special view of a world where things bend and fold rather than crack and break; and systems are tough like animals and birds rather than fragile like current automobiles and aircraft. As a result, this region and this department have something special to offer.

The key is for students to find for themselves a special combination of skills. The department offers many possibilities to its students, from opportunities for focused study to innovative research.

- Through a special student exchange program with the University of Rhode Island, students may spend one or two semesters in the Department of Textiles, Fashion Merchandising, and Design. Possible coursework includes fashion retailing, fashion buying, textile marketing, textile history, fashion history, apparel design, apparel production, and clothing and human behavior.

- Students enrolled in Materials and Textiles who have an interest in fashion, buying, or merchandising that extends beyond the course offerings at UMass Dartmouth are eligible to become “visiting students” at the

Fashion Institute of Technology. Students are responsible for tuition and other costs assessed by the Fashion Institute of Technology.

- Materials students can also take advantage of exchange opportunities with several universities in eastern and western Europe.

- The Textile Sciences Building has approximately 15,000 square feet of laboratory space devoted to research and education, with equipment for turning out new materials into yarn from the raw material and the conversion of these yarns into new structures from wovens and knits to composites and kidneys.

- Equipment is also available for treating small amounts of fibers, yarns, and fabrics both atmospherically and under pressure. A variety of chemical finishes can be applied to fabrics to produce various functional properties. Students gain experience with most wet finishing operations and evaluating performance properties during each processing stage.

- Most of the research conducted by undergraduate and graduate students, in conjunction with faculty members, is in the area of materials science. The department has purchased about \$700,000 in new equipment over the last seven years. UMass Dartmouth is a member of the National Textile Center and shares resources with seven other universities in the US who are working together to rebuild the textile industry into the future soft materials industry.

The Materials and Textiles Department awards a number of industry-sponsored scholarships every year, based on both need and academics. Textile programs qualify under the New England Regional Student Program to allow non-resident students from the other New England states to pay a reduced non-resident tuition.

Faculty and Fields of Interest

Paul Calvert (chairperson) materials science, polymer and ceramic structure/property relations, biomaterials, ink jet printing

Qinguo Fan textile chemistry, chemical analysis, wastewater treatment, color science, dye chemistry

Yong Ku Kim textile engineering, fiber/polymer physics, composite materials, polymer engineering, medical textiles

Kenneth Langley flock materials, microscopy, statistics, yarn processing, natural fibers

Samuel C Ugbohue polymer, fiber, and textile science, yarn manufacture, knitting and clothing engineering

Steven B Warner fiber formation and properties, material science, polymers, absorbency, anisotropic wicking, nonwoven technology, microscopy, thermal analysis, biomaterials

Mission

The Department of Materials and Textiles:

- Supplies appropriately educated and trained, quality graduates at the Bachelor of Science and Master of Science levels for graduate schools or leadership roles in the textile and allied industries,
- Provides research and development capability necessary for sustained improvement and long term growth in the textile sector, and
- Provides outreach programs with specialized expertise to disseminate knowledge and information, and to drive the solution of increasingly complex and textile-related problems.

We strive to stimulate regional as well as national industry in the fiber, textile, and associated fabricated product businesses to compete successfully in the global marketplace.

Materials and Textiles

Materials

BS Degree

Note: Materials/Materials Technology is a revision of the previous Textile Science/General Option major; it goes into effect Fall 2005.

Materials Technology Option

Requirements

This program of study offers a unique blend of courses in the materials sciences, manufacturing, and management.

The linking of science, engineering, and management addresses the objectives of the many small and medium-sized technology companies in New England.

This innovative program is designed to prepare students for careers in small and large companies that develop or use new materials for advanced technology in a broad range of areas including medical devices, sports, electronics, optics, textiles, food, and cosmetics.

Business Administration Minor

The courses in Management Information Systems, Accounting, Management, Marketing, and Economics comprise a special version of the Business Administration Minor offered by the Charlton College of Business. Students' transcripts will display the Materials/Materials Technology Option major and a Business Administration minor. *This minor is required for completion of the Materials/Materials Technology Option major.*

Specialization

Students should choose a group of electives in the final year to provide a specialization in textiles, biomaterials, electronic materials, or another area, as agreed with the advisor.

Calculation of GPA in Materials majors

Students must have a 2.000 cumulative grade point average (GPA) for all courses taken at the university in order to graduate. Students must also have a 2.000 cumulative GPA in the major. For purposes of this computation:

1

All courses with a TES, TEC, or TET prefix count in calculating the GPA;

2

Courses required for the major but taken outside the major discipline are not counted in the calculation of the major cumulative GPA;

3

As is the case for all University courses, only the most recently earned course grade (whether higher or lower) shall enter in the calculation of the major cumulative GPA.

Semester Credits
First **Second**

First Year

ENL 101, 102	Critical Writing and Reading I, II	3	3
MTH 101, 102	Elements of College Math I, II	3	3
GBA 101	The Business Organization I, II	1.5	1.5
TES 105	Contemporary Issues in Materials Science	3	
TES 110	Environmental Science and Business		3
	General Education Electives	3	6
		13.5	16.5

Second Year

ACT 211,212	Accounting I, II	3	3
TES 201	Mechanical Properties of Materials		3
ECO 231,232	Principles Micro/Macroeconomics	3	3
MGT 212	Business Statistics	3	
MKT 211	Principles of Marketing	3	
ENL 265	Business Communications		3
TES 252	Materials Seminar	1	
	General Education Electives	3	3
		16	15

Third Year

TES 300	Textile Structures and Properties	4	
TES 301	Materials Processing I	4	
TES 304	Elec & Optical Properties of Materials		3
TES 305	Materials Testing		4
TES 310	Statistical Quality Control	3	
TES 321	Soft Materials and Fluids	3	
FIN 312	Financial Management		3
BIS 315	Information Systems	3	
MGT 311	Organizational Behavior		3
		17	16

Fourth Year

TES 401	Materials Processing II	4	
TES 402	Advanced Materials and Composites		3
TES 421	Biological and Biomedical Materials	3	
MGT 333	Quantitative Business Analysis	3	
MGT 345	Operations Management		3
TES 460	Materials Selection and Design		3
TES 463	Senior Project/Research Experience	3	
	Technical Elective	3	6
		16	15

Total Credits:

125

Note: In the junior and senior years some Materials courses are offered every other year. Upperclass students must take these courses when offered as soon as possible, or risk not graduating on time.

General Education Departmental Requirements

Students majoring in Materials/Materials Technology Option will meet their departmentally-specified General Education requirements as follows:

Area E: Satisfied by ECO 231

Area I, Tier 2: Satisfied by TES 311

Area W, Tier 2: Satisfied by ENL 265

Area O: Satisfied by TES 252

Textile Science

BS Degree

Note: Materials/Materials and Biomaterials Engineering is a revision of the Textile Science/Applied Fiber Materials major that went into effect Fall 2004.

Materials and Biomaterials Engineering Option

Requirements

This option emphasizes science and engineering principles and how these interact with processing and high-performance materials, for students who are more inclined towards careers in product development, industrial engineering, or research, rather than in management.

New freshman students will be considered for this option during an initial advising session before the beginning of their first semester. Admissions will look for a secondary school background in mathematics and science similar to that expected for admission to study in biology, engineering, medical laboratory science, and nursing.

Department Policy Statements

1

Upper-division students with at least a 2.5 grade point average may, upon approval of the department chairperson, earn up to 3 credits in Experiential Learning, which may be applied to fulfill a free or a materials/textiles elective.

2

Students must consult with their academic advisor prior to registering for any classes. Transfer students should be aware of possible scheduling problems due to the sequential nature of the Department's curricula, that may cause a delay in meeting graduation requirements. Transfer students are therefore especially encouraged to meet with their academic advisor early in order to satisfy prior-year requirements as soon as possible. In any case, final responsibility for keeping pace with the curriculum and taking required courses in sequence rests with each student.

	Semester Credits	
	First	Second
First Year		
TES 105	3	
TES 110		3
CHM 151, 152	3	3
CHM 161, 162	1	1
ENL 101, 102	3	3
MTH 111, 112	4	4
General Education Electives	3	3
	17	17
Second Year		
TES 201		3
TES 252	1	
TES 255		1
BIO 101	3	
EGR 232		3
EGR 241	3	
ENL 266		3
MNE 231	4	
MTH 104		3
MTH 211		4
PHY 113	4	
	15	17
Third Year		
TES 300	4	
TES 301	4	
TES 304		3
TES 305		4
TES 310	3	
TES 321	3	
General Education Electives		6
	14	13
Fourth Year		
TES 401	4	
TES 402		3
TES 422	3	
TES 421	3	
TES 460		3
TES 463		3
Technical Electives	6	6
	16	15
Total Credits		123

Note: In the junior and senior years some specific courses maybe offered every other year. Upper division students must take these courses when offered as soon as possible, or risk not graduating on time. The senior year technical electives may be selected from upper division courses in any science or engineering subject.

General Education Departmental Requirements

Students majoring in the Materials and Biomaterials Engineering Option will meet their departmentally-determined General Education requirements as follows:

Area E: Satisfied by TES 105

Area I, Tier 2: Satisfied by TES 402 or TES 463

Area W, Tier 2: Satisfied by ENL 266

Area O: Satisfied by TES 252 or TES 463

Materials Courses

Alternative Paths Program Requirements

Depending on the results of placement testing, new freshman students may be placed into one of the following first-year curricula in lieu of the standard curriculum.

Materials/Materials Technology Option

		Semester Credits	
		First	Second
<i>First Year Courses for Precalculus-Ready Freshmen</i>			
ENL 101,102	Critical Writing and Reading I, II	3	3
MTH 101, 102	Elements of College Mathematics I, II	3	3
GBA 101	The Business Organization	3	
TES 105	Contemporary Issues in Materials Sciences**	3	
TES 110	Science and Business		3
	General Education Electives	3	3
		15	12

First-Year Courses for Algebra-Ready Freshmen

ENL 101, 102	Critical Writing and Reading I, II	3	3
GBA 101	The Business Organization I,II	3	
MTH 100	Basic Algebra	3*	
MTH 101	Elements of College Mathematics I		3
TES 105	Contemporary Issues in Materials Sciences**	3	
TES 110	Environmental Science and Business		3
	General Education Electives	3	3
		15	12

Materials/Materials and Biomaterials Engineering Option

First Year Courses for Precalculus-Ready Freshmen

ENL 101,102	Critical Writing and Reading I, II	3	3
CHM 151	Principles of Modern Chemistry I		3
CHM 161	Introduction to Applied Chemistry I		1
MTH 131	Precalculus	3	
MTH 111	Calculus For Science and Engineering I		4
TES 105	Contemporary Issues in Materials Sciences**	3	
TES 201	Fiber Materials		3
	General Education Electives	6	
		15	14

First-Year Courses for Algebra-Ready Freshmen

ENL 101, 102	Critical Writing and Reading I, II	3	3
CHM 151	Principles of Modern Chemistry I		3
CHM 161	Introduction to Applied Chemistry I		1
MTH 100	Basic Algebra	3*	
MTH 131	Precalculus		4
TES 105	Contemporary Issues in Materials Sciences**	3	
TES 201	Fiber Materials		3
	General Education Electives	6	
		15	14

* Students receive 3 administrative credits for Math 100. Administrative credits do not count towards the total credits required for graduation.

** This course can also be taken as GEE 202 Materials for Medicine and Engineering for the Year 2020.

TES 105 three credits S, E

Contemporary Issues in Materials Sciences

A student-centered, discovery-oriented, laboratory-based science course dealing with fundamentals and basic quantitative aspects of materials sciences and the materials industry where they interface with biology and medicine. Students learn about opportunities within materials and hear from materials entrepreneurs.

TES 110 three credits S

Environmental Science and Business

Physical and chemical sciences and technologies for consumers and business persons to deal intelligently in protecting the health of themselves, their workers and the environment. Fundamental chemical principles are discussed in the context of the air and water pollution, and its remediation, assessment of health risks, use/safe handling and disposal of hazardous industrial chemicals/wastes.

TES 201 three credits S

Properties of Materials

Prerequisite: Sophomore standing
The molecular structure and morphologies of materials with a focus on soft materials. A foundation is provided for understanding the physical, chemical, and mechanical properties and behavior of materials. Production processes and applications are also examined.

TES 252 one credit

Materials Seminar

Prerequisite: Sophomore standing
Discussions and presentations on materials, processes and products. Students learn to interrelate knowledge from all forms of materials, their processing and applications. Outside speakers, faculty and student lectures will provide an overview of the continuity from course to course in the Textile Sciences Programs.

TES 255 One credit

Biology for Engineers

A survey of tissue properties and tissue-materials interactions for materials students. The concept of biocompatibility will be explored. The functions of the clotting system, of macrophage action and of the immune system will be covered.

TES 262 three credits S

Microscopy

Various microscopic techniques in fiber identification and structure, composition of blends, physical, chemical, and biological conditions of fibers and yarns. Students are taught the principles of various microscopic

and photomicroscopic techniques—scanning electron, optical, polarized light, atomic force, and so on—as well as introduced to the principles of image analysis.

TES 298 one to six credits

Experiential Learning

Prerequisites: At least sophomore standing; permission of the instructor, department chairperson, and college dean. Work experience at an elective level supervised for academic credit by a faculty member in an appropriate academic field. Conditions and hours to be arranged. Graded CR/NC. For specific procedures and regulations, see selection of catalogue on Other Learning Experiences.

TES 300 four credits

Textile Structures and Properties

3 hours lecture, 3 hours laboratory
Prerequisite: TES 105, upper-division standing
A study of the design and properties of yarns and fabric structures. A foundation is provided for understanding the physical, chemical and mechanical properties and behavior of fibrous structures. An engineering approach to textile structures will be presented.

TES 301 four credits

Materials Processing I

3 hours lecture, 3 hours laboratory
Prerequisite: TES 105, upper-division standing
The thermodynamics and kinetics of melt, solid and vapor-phase processing of materials. Relationships between processing parameters and structure. Applications to casting, forming, powder processing, molding, extrusion, spinning, rolling and forging.

TES 304 three credits

Electrical and Optical Properties of Materials

Prerequisite(s) TES 201, upper-division standing
An introduction to the electronic and optical properties of materials including inorganic, organic and polymeric insulators, semiconductors and metals. A survey of applications in optical and electronic devices.

TES 305 four credits

Materials Analysis

3 hours lecture, 3 hours laboratory
Prerequisites: TES 201, upper-division standing
An introduction to the analytical methods for characterizing materials. Instrumentation to determine chemical, mechanical, thermal and electrical properties of materials are

considered. Process/product evaluation by physical, chemical and microscopic methods are also discussed with help of case studies.

TES 310 three credits

Statistical Quality Control

Prerequisite: TES 105, upper-division standing
The vision of never-ending improvement in quality. Statistical quality control charts are developed for implementing and maintaining economic control of processes. Diagnostic techniques for determining faults are explored.

TES 321 three credits

Soft Materials and Fluids

Prerequisite: TES 201, upper-division standing
The properties, structures and rheology of soft condensed matter such as polymer melts, colloids, gels, liquid crystals and amphiphiles. Basic properties of soft materials are discussed. A wide range of applications of soft matter is exemplified. These real world products include detergent, paints, plastics, personal care products, food and gels.

TES 331 three credits

Textile Technology

Theory and procedures employed in the processing of raw materials into yarns and fabrics, including natural and manufactured fibers. This course is designed for Textile Design/Fiber Arts students.

TES 352 three credits

Seminar

Prerequisite: Upper-division standing
Improving oral communication skills by learning and using concepts in materials and textile sciences. Students attend seminars presented by outside speakers, faculty, and graduate students and then each student prepares a seminar for the class.

TES 401 four credits

Materials Processing II

3 hours lecture, 3 hours laboratory
Prerequisite: Upper-division standing
An introduction to processing methods for the electronics industry as a new paradigm of how things are made. Production of electronic products, semiconductors, production of silicon wafers, integrated circuits (IC), thin film deposition, IC component connection, productivity and quality improvement are also discussed

TES 402 three credits

Advanced Materials and Composites

Prerequisites: Upper-division standing
Processes used for producing functionally advanced and intelligent fibrous materials:

Lamination, coating, flocking, wet layup, resin transfer molding, sheet molding, pultrusion, and filament winding. Also studied are resins for coating, adhesives and polymeric matrices, and reinforcing fibrous structures and preforms such as prepreg, fabrics, 3-D woven fabrics, nonwovens, nanofibers, braided and knotted structures. Properties of the resulting structures and their application areas such as nanocomposites, biological fibrous composites, medical, military, and other industrial and functional products are considered.

TES 406 three credits

Computer Applications in Materials

Prerequisite: Upper-division standing
A survey of computer applications and computer integrated manufacturing (CIM) systems in processing. The course covers automatic process control, quality monitoring, and manufacturing data acquisition supported by microprocessors and personal computers. Course involves extensive hands on assignments using MS-DOS, Spreadsheet (LOTUS 1-2-3), word processing, business graphics, databases, and BASIC programming software.

TES 407 three credits

Fiber Reinforced Polymeric Materials

2 hours lecture, 3 hours laboratory
Prerequisites: TES 201, 301
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. Meets with TET 517.

TES 410 three credits

Manufacturing Facilities Design

Prerequisite: Senior standing
A study of the design of a new manufacturing plant. General consideration is given to plant design and layout installation, plant service functions, and engineering economy related to plant engineering. New manufacturing methods and processes in industry are surveyed. Computer-aided design and manufacturing (CAD/CAM) concepts and practices are considered in developing layouts of theoretical process- and/or product oriented plants. Service facilities design is also considered.

TES 411 three credits

Managing Technology

Prerequisite: Senior standing
Understanding the impact of technology on manufacturing and society. The course

analyzes the effects of technology on society and various business functions, such as product design, manufacturing processes, marketing strategies, and research and development. Topics include technical innovation, entrepreneurship, and patent protection. Ethical issues related to technology, including product liability, industrial espionage, and the environment, are discussed.

TES 421 three credits

Biological and Biomedical Materials

Prerequisite: Upper-division standing
Biomedical materials are synthetic materials working in a biological system. This requires an understanding of the similarities and differences between biological and synthetic materials and of the wide range of reactions between them.

TES 422 three credits

Advanced Electronic Properties

Prerequisite: Upper-division standing
An introduction to conducting and semiconducting properties of inorganic, organic and composite materials. Applications of the concepts to various electronic devices, including microelectronics, batteries, fuel cells, antennae, sensors and actuators, are also discussed.

TES 460 three credits

Materials Selection and Design

Prerequisite: Upper-division standing
A project-based integrative course taking a component through design, materials selection, finite element analysis, prototyping and testing. Students will use CAD and FEM programs and materials selection systems.

TES 463 three credits **O, W**

Senior Project

Prerequisite: Upper division standing
Exposure to and experience in timely research and development projects either in the laboratory or a real world setting—at companies in the area. Most but not all topics will be in the area of textile sciences: (a) Product Design and Analysis or Reverse Engineering; (b) Plant Design, Marketing, Business Strategy Research based on library work; (c) supervised lab intensive project; (d) Directed/Independent Study with Industrial Internship.

TES 482 three credits

Design for Function

A case study in the development of soft materials that have engineering designs to provide specific properties. Examples include dome structures, geotextiles, bullet-proof

vest, artificial turf, and medical fabrics. The courses correlates properties of materials, engineering principles in processing, and the design of structures with the desired properties for a particular functional use.

TES 495 variable credit

Independent Study

Prerequisites: Upper-division standing; permission of instructor, department chairperson, 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.

TES 196, 296, 396, 496 three credits

Directed Study

Prerequisites: Permission of the instructor, department chairperson, 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 Chemistry Major

BS degree

The Textile Chemistry major will not be offered starting Fall 2005, but individual undergraduate and graduate courses will continue to be available to enable students to complete their programs. For requirements, see previous catalogues.

Textile Chemistry Courses

TEC 298 one to six credits

Experiential Learning

Prerequisites: At least sophomore standing; permission of the instructor, department chairperson, and college dean
Work experience at an elective level supervised for academic credit by a faculty member in an appropriate academic field. Conditions and hours to be arranged. Graded CR/NC. For specific procedures and regulations, see selection of catalogue on Other Learning Experiences.

TEC 303 three credits **S**

The Art of Dyeing with Natural Dyes

The natural dyes used by throughout history. Methods relating to the extraction and preparation of the dyes from woods, bark, and insects are studied. Laboratory work consists of the preparation of the dye-baths and the actual application of the dyes to fabrics. Logwood, cochineal, madder, fustic, indigo, quercitron, osage orange and hyperic are some of the dyes utilized.

TEC 410 three credits

Polymer Chemistry

Prerequisites: CHM 151, 152 or CHM 251, 252
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 polymers systems, and preparation of their corresponding monomers. Meets with TEC 510.

TEC 433 three credits

Color Science

2 hours lecture, 3 hours laboratory
Prerequisite: Senior standing
How color affects daily life and the formation and measurement of color. Color, colorants and the coloring of materials are examined.

What color means, the effect of light on color, and the results of this effect on the human eye and mind are studied. The physical and chemical processes that apply colorants to textiles and methods for incorporating colorants into paints, inks, and plastics are also examined.

TEC 463, 464 three credits each
Senior Thesis

Prerequisite: Senior standing
Students prepare a thesis proposal and do laboratory research in one of the following areas: polymer chemistry, fibers, dyeing, printing and finishing. Findings are presented at the end of the second semester.

TEC 485, 486 three or six credits
Introduction to Research

Prerequisite: Junior standing
Students accepted for research study by a faculty research advisor are assigned a topic for investigation. This course aims to introduce the student to research and develop his or her proficiency in the analysis, solution and presentation of his or her investigating work.

TEC 495 variable credit
Independent Study

Prerequisites: Upper-division standing; permission of instructor, department chairperson, 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 196, 296, 396, 496 three credits
Directed Study

Prerequisites: Permission of the instructor, department chairperson, 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.

Graduate Courses in Textile Chemistry

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 502 three credits
Physics and Chemistry of Dyeing

This is a lecture course concerned with the physiochemical 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 physiochemical 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 506 three credits
Survey of Current Textiles

Studies in this course include a survey of the fundamental reference works and literature of Textile Chemistry. Timely reports are required concerning recent advances in the manufacture, modification, dyeing and finishing of synthetics and blends.

TEC 508 three credits
Advanced Textile Printing

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

Chemical finishes which modify fabric appearance, feel, and serviceability (to shrinkage, soiling, mildew, moths, wrinkling, fire, water, static electricity, etc.) are discussed, along with the means used to apply them. The production of special effects (permanent press, crepe, moire, etc.) is also studied.

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 polymers systems, and preparation of their corresponding monomers. Meets with TEC 410.

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 repellency, and fire retardance.

TEC 523 one-half credit
Textile Laboratory Practice I

Practice and experimentation in the dyeing of fibers with various dyes, wash and lightfastness properties, finishing.

TEC 524 one-half credit
Textile Laboratory Practice II

A continuation of TET 524, includes fiber microscopy, textile printing exercises, experiments in color science including measurement and assessment.

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.

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.

Graduate Courses in Textile Technology

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 502 three credits

Yarn Technology

Continuation of TET 501.

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 511 three credits

Fabric Technology

An investigation into advanced styling and the development of methods of textile fabrication. Requirements of modification and the introduction of new procedures are studied pertaining to new design in fabric construction for improved performance and specific uses. Extensive research of reference material is conducted with written reports submitted on assigned related subject matter.

TET 512 three credits

Fabric Technology

Prerequisite: TET 511

Continuation of TET 511.

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. Meets with TES 407

TET 521 three credits

Statistical Methods of Quality Control

A study of methods and systems by the use of statistical analysis in the design of experiments, in the testing of materials and in the evaluation of test data as applied in the

Note: Textiles graduate courses are not open to undergraduates. See the Graduate Catalogue for graduate general and program requirements.

interest of improvement and control of quality, as well as studies of processing efficiency.

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 nonwoven fabrics. The methods of continuum mechanics and differential geometry to interrelate material properties and end-use properties are considered.

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.