

Department of Construction Management and Wood Products Engineering

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Participating Faculty

ANAGNOST, Chair, (Wood Anatomy, Biodegradation of Wood, Micro-technique), CROVELLA (Residential Construction, Sustainable Construction Management), HANNA (Ultrastructure, Microscopy, Image Analysis), KYANKA (Construction, Applied Mechanics, Engineering Design), MEYER (Wood Properties, Wood Utilization, Anatomy), MORSI-HUSSEIN (Construction Engineering, Applied Mechanics, Structures), SMITH, J. (Cost Engineering, Construction Management, Sustainable Construction), SMITH, W. (Wood Preservation and Protection, Wood Moisture Relations and Drying, Manufacturing and Processing, Marketing), TISS (Construction Safety, Estimating, Planning and Scheduling, Construction Management)

The Department of Construction Management and Wood Products Engineering offers two bachelor of science degrees: construction management and wood products engineering and graduate education leading to the master of science, master of professional studies, and doctor of philosophy degrees through the Division of Engineering.

The degree programs emphasize principles and practices of sustainable construction. By learning about sustainable construction and manufacturing practices, the use of renewable resources in construction and methods to ensure energy efficiency, ESF graduates can literally build a sustainable future. They also learn how to produce products from wood, be it furniture, construction material, or utility poles — in the most energy efficient way possible. Students take classes, labs and lectures in the newly renovated Baker Laboratory that features high-tech lecture halls, pilot-scale manufacturing equipment for building materials and wood products, an accredited engineering test facility, and computer labs equipped with the latest commercial software for planning, scheduling, project management and estimating. Instruction is tailored to the interests of individual students through the selection of electives.

At the undergraduate level, a concentration area in sustainable construction and renewable materials is available for students with an interest in green construction and building materials. Minors that enhance business skills in general management studies, marketing, and entrepreneurship are available for qualified students. Students interested in these or other minors should meet with their advisors as soon as possible.

Professional growth of students is stimulated by active membership in student chapters of professional construction and wood science organizations. Students are encouraged to join at least one organization that is of particular interest to them: the Student Construction Association (affiliated with The Associated General Contractors of America and General Building Contractors of New York State), or the Forest Products Society student chapter.

Many students who enter the programs in construction management or wood products engineering are transfer students. Graduates of A.S. programs in liberal arts, math/science, and engineering/science as well as A.A.S. programs in architectural, civil, construction, mechanical, and wood technologies are encouraged to apply. Students with or without two-year degrees who meet all lower-division requirements and have 62 credits in acceptable coursework transfer as juniors for a four-semester program. Transfer students who have completed pre-calculus, but have not completed chemistry and/or physics or have not met most of their general education requirements generally finish in five or six semesters.

Bachelor of Science in Construction Management

The commercial construction industry represents almost 8 percent of the nation's gross domestic product, while the entire construction industry represents 20 percent of the nation's GDP. Because of this economic importance the industry is very competitive. Also, there are many small firms whose presence increases competition. With more construction companies bidding on jobs, organizations with the best-prepared professionals using the latest technology are the most successful. This competition applies not only to contractors, but also many others involved in construction operations such as engineers, human resource managers, and material and equipment suppliers. People engaged in this industry must have state-of-the-art skills and knowledge to thrive.

The construction management degree program prepares students for management careers in the construction industry. The objectives of the program are twofold: to study the various methods used to take a design into the field and construct a quality structure in the most efficient and effective manner with minimal environmental impacts, and to provide an understanding of basic engineering and environmental considerations in construction.

Students learn the behavior of a wide variety of construction materials, including wood and engineered wood products, and study the analysis of various structural components and systems. Courses include construction safety, construction equipment, construction methods, building codes and zoning, contracts and specifications, planning and scheduling, estimating, construction management, timber structural analysis, soil mechanics, composite materials, and computer applications.

Environmental concerns are incorporated within the program by addressing workplace safety, environmental impact evaluation, and codes concerning structural, fire, and hazardous material requirements. Emphasis on environmental and personal safety includes asbestos mitigation, noise pollution, air monitoring and sampling techniques.

A concentration in sustainable construction and renewable materials provides additional course offerings that support the field of sustainable construction with topics such as innovations in residential construction and green entrepreneurship. Energy efficiency in buildings is studied based upon the New York state energy conservation code and federal guidelines. Legal and social aspects are integrated into the program in the later stages.

Graduates of the construction management program are well prepared for careers in a very challenging and dynamic field. Positions held by alumni include construction project manager,

safety director, OSHA compliance officer, construction engineer, estimator, company executive, and planner/scheduler.

Students may enter the bachelor of science program as first-year students or as transfer students. Students who are preparing to transfer to ESF as juniors must have earned at least 62 credits of college coursework, in courses comparable to the lower-division course requirements.

Undergraduate Program Requirements

Lower Division Required Courses (38 credits)

Students who enter as freshmen complete a one-credit course, WPE 132, and 12 credits of electives. Students who enter as transfer students complete a zero-credit course, ESF 332, and at least 13 credits of electives at the lower division.

Courses			Credits	
WPE	132	Orientation Seminar: Wood Products Engineering <i>Required for students who enter as freshmen.</i>		1
APM	105	Calculus I <i>Meets the requirements for general education skills and knowledge area. A complete listing of courses that meet general education standards established by SUNY is listed in Undergraduate Education.</i>	G	4
APM	106	Calculus II		4
WPE	202	Introduction to Professional Communications		3
CLL	190	Writing and the Environment	G	3
CLL	290	Writing, Humanities and the Environment	G	3
EFB	120	The Global Environment and the Evolution of Human Society		3
ERE	221	Engineering Mechanics: Statics		3
ERE	362	Mechanics of Materials		3
FCH	150/ 151	General Chemistry I and Laboratory	G	4
FOR	207	Introduction to Economics	G	3
PHY	211/ 221	General Physics I and Laboratory		4

Lower Division Electives(24-25 credits)

Students use elective credits to pursue the concentration in Sustainable Construction and Renewable Materials.

Electives <i>Required for students who enter as transfer students.</i>	12-13
General Education Course: American History	G 3

General Education Course: Other World Civilizations	G	3
General Education Course: Western Civilization	G	3
General Education Course: The Arts	G	3

Upper Division Required Courses (53 credits):

ESF	332	Seminar for New Transfer Students Required for students who enter as transfer students.	0
APM	391	Introduction to Probability and Statistics	3
CIE	337	Soil Mechanics and Foundations I	4
CIE	338	Foundation Engineering OR Elective	3
ERE	371	Surveying for Engineers	4
FOR	360	Principles of Management	3
WPE	331	Construction Safety	3
WPE	335	Cost Engineering	3
WPE	342	Light-Frame Construction	3
WPE	343	Construction Estimating	3
WPE	387	Wood Structures and Properties	3
WPE	404	Timber Design Project	3
WPE/LSA	410	Computer-Aided Design and Drafting	3
WPE	422	Composite Materials	3
WPE	453	Construction Planning and Scheduling	3
WPE	454	Construction Project Management	3
WPE	455	Construction Contracts and Specifications	3
WPE	497	Senior Seminar	3

Upper Division Electives (12 credits)

Total minimum credits for the degree 127 credits

Concentration in Sustainable Construction and Renewable Materials. (12 credits) from the following:

CIE	326	Engineering Materials
ERE	519	Green Entrepreneurship
EST	426	Concepts of Sustainable Development
EST	550	Environmental Impact Analysis
WPE	330	Building Codes
WPE	376	Decay of Wood Products
WPE	388	Wood Identification
WPE	444	Materials Marketing

Bachelor of Science in Wood Products Engineering

The bachelor of science degree in wood products engineering is accredited by the Society of Wood Science and Technology.

Wood is the premier material for manufacturing, building and construction. It is renewable and produced from a sustainable natural resource. Wood is strong, lightweight, economical, long lasting and attractive and is made into countless products desired by society. Our graduates contribute to and are employed by the industries that manufacture such high-value wood products as hardwood lumber and furniture, efficient and economical building materials such as softwood lumber, plywood and engineered composite materials, and industrial materials such as treated poles, piling and timbers. Our graduates also contribute to and are employed by the related lumber and building material merchandising and distribution industries. The competitive nature of industry today has caused wood products manufacturing companies in recent years to concentrate effort on improving manufacturing efficiency and material usage. Wood products graduates from ESF have the knowledge and skills necessary to contribute as production managers, and engineers, and in manufacturing to help these firms most efficiently process the best mix of lumber quality and cost into products while minimizing waste. These graduates also contribute to the design and most effective and appropriate utilization of composite and engineered wood products.

While most activities are directed toward the forest products manufacturing, utilization and merchandising industries of New York, the Wood Products Engineering program has a long tradition of national and international service.

The program provides a broad education, encompassing study of the anatomical, physical, and mechanical properties of wood. Students learn to apply basic and engineering sciences to the broad spectrum of products made from wood and its derivatives. Subject areas cover the anatomical, physical and mechanical properties of wood and components utilizing wood, their industrial applications, manufacturing and marketing of wood products, and the economic aspects of this renewable resource. A materials science approach is used, similar to the specialized studies associated with metallurgy, plastics, and other engineering materials.

A core curriculum is supplemented by elective concentration areas to allow students to design their own specialized courses of study.

The curriculum has been planned to produce graduates who understand why wood behaves as it does and who can contribute to the utilization and production of virtually any type of wood product.

Essential knowledge for all wood products engineering graduates includes:

- Identification, properties, and uses of wood
- Classification of tree species; relations between species and genera of important North American timber species, including growth ranges
- Wood-moisture relationships
- Wood biology: anatomy and decay
- Wood protection
- Production of solid wood and composite products

- Wood mechanics — design of wood structural elements
- Marketing of wood products
- Use of wood in construction and other engineered applications such as furniture

Additionally, other courses address environmental concerns and natural resource professionalism to provide the well-rounded educational experience required of a graduate from a leading wood science and technology curriculum offered at one of the foremost colleges dealing with renewable natural resources.

Three concentration areas are available for Wood Products Engineering students. Each student is required to develop an educational plan designed to meet career objectives.

Elective concentration areas:

1. Marketing and Production
2. Sustainable Construction and Renewable Materials
3. Wood Science

Marketing and Production:

Students selecting the marketing and production concentration prepare themselves for careers in a wide variety of manufacturing operations, ranging from primary lumber, plywood panel, engineered composites, or particleboard mills to secondary production operations such as the manufacture of millwork or furniture; or they enter the wholesale or retail marketing and sales fields, dealing with forest products and/or other building materials. Others work for suppliers to the forest products industry, marketing products such as paints, coatings or adhesives, or work for machine manufacturers. Minors that enhance business skills in general management studies, marketing, and entrepreneurship are available for qualified students.

Essential knowledge for marketing and production concentration graduates:

- The importance of forest products in the national and international marketplace
- The role of marketing in the distribution of goods
- Physical, mechanical and other characteristics and properties of wood which affect design and performance of products in use
- Production scheduling and wood manufacturing operations
- Operations management
- Personnel and labor relations

Sustainable Construction and Renewable Materials:

Students who choose the concentration in Sustainable Construction and Renewable Materials are preparing themselves for careers that encompass the use of green building materials, including solid wood products, engineered wood products and the environmental impact of such use.

Wood Science:

Students in the wood science concentration take courses dealing with the biological aspects of wood (e.g., anatomy, tree growth-wood quality relations, effects of decay) and the physical characteristics of the material (e.g., physical properties, mechanical and engineering properties, the physics of preservation or seasoning).

Some wood science students are preparing for graduate school and eventually enter a career in research, such as in a private or government research laboratory, or with a trade association or service organization. Others find rewarding and challenging careers in teaching or industrial settings.

Essential knowledge for wood science concentration graduates:

- Relations between tree growth and wood properties
- Wood-water relationships; the effects of moisture on the properties of wood
- Decay processes
- Evaluation and analysis of the physical and mechanical properties of wood
- Wood preservation and protection

Students may enter the bachelor of science program as first-year students or as transfer students. Students who are preparing to transfer to ESF as juniors must have earned at least 62 credits of college coursework, in courses comparable to the lower-division course requirements.

Undergraduate Program Requirements

Lower Division Required Courses (45 credits)

APM	105	Calculus I <i>Meets the requirements for general education skills and knowledge area. A complete listing of courses that meet general education standards established by SUNY is listed in Undergraduate Education.</i>	G	4
APM	106	Calculus II		4
APM	153	Computing Methods		3
CLL	190	Writing and the Environment	G	3
CLL	290	Writing, Humanities and the Environment	G	3
EFB	120	The Global Environment and the Evolution of Human Society		3
EFB	101/ 102	General Biology I and Laboratory	G	4
EFB	336	Dendrology		3
ERE	221	Engineering Mechanics: Statics		3
FCH	150/ 151	General Chemistry I and Laboratory		4
FOR	207	Introduction to Economics	G	3
PHY	211/ 221	General Physics I and Laboratory		4
WPE	132	Orientation Seminar: Wood Products Engineering <i>Required for students who enter as freshmen.</i>		1
WPE	342	Light Construction		3

Lower Division Electives (15):

Electives			3
General Education Course: American History	G		3

General Education Course: Other World Civilizations	G		3
General Education Course: Western Civilization	G		3
General Education Course: The Arts	G		3

Upper Division Required Courses (41 credits):

ESF	332	Seminar for New Transfer Students Required for students who enter as transfer students.		0
APM	391	Introduction to Probability and Statistics		3
ERE	362	Mechanics of Materials		3
FOR	333	Managerial Economics for Environmental Professionals		3
FOR	360	Principles of Management		3
WPE	322	Mechanical Processing		3
WPE	326	Fluid Treatments		3
WPE	376	Decay of Wood Products		3
WPE	387	Wood Structures and Properties		3
WPE	388	Wood and Fiber Identification Laboratory		2
WPE	404	Timber Design Project		3
WPE	422	Composite Materials		3
WPE	444	Materials Marketing		3
WPE	487	Fundamental Properties of Wood		3
WPE	497	Senior Seminar		3

Elective Concentration courses All students must complete at least 12 credit hours of elective concentration courses selected from an advisor-approved sequence of available courses.		12
Electives Students who enter as transfer students must complete at least 16 credits of upper-division electives.		15-16

Total minimum credits for the degree 128 credits

Concentration Electives

Marketing and Production. (12 credits) from the following:

ACC	201	Financial Accounting for Non-Management Students
EEE	370	Introduction to Entrepreneurship and Emerging Enterprises
FIN	301	Finance for Non-Management Students
FEG	430	Engineering Decision Analysis
FOR	415	Forestry Consulting and Wood Procurement
FOR	488	Natural Resources Agencies and Administration
LPP	225	Introduction to the Legal System

MAR	255	Principles of Marketing
SHR	355	Strategic Human Resource Management
PSE	456	Management in the Paper Industry

Sustainable Construction and Renewable Materials. (12 credits) from the following:

CIE	326	Engineering Materials
ERE	519	Green Entrepreneurship
EST	426	Concepts of Sustainable Development
EST	550	Environmental Impact Analysis
WPE	330	Building Codes
WPE	343	Construction Estimating

Wood Science. (12 credits) from the following:

EFB	307	Principles of Genetics
EFB	320	General Ecology
EFB	325	Cell Physiology
EFB	326	Diversity of Plants
EFB	340	Forest and Shade Tree Pathology
EFB	351	Forest Entomology
EFB	440	Mycology
EFB	530	Plant Physiology
FCH	221-224	Organic Chemistry I and II
FCH	531	Wood Chemistry II
FOR	334	Silviculture
PHY	104	Physics II

Graduate Program

Graduate areas of study related to construction management and wood products engineering allow students with technical degrees to engage specific topics of current interest. There is an overall objective of having students look at the broad environmental implications of the construction process, to be efficient and environmentally correct in their use of materials, and to integrate current technology to a practicum, thesis or dissertation, as appropriate to the graduate degree. The department offers three degrees: the Master of Professional Studies (M.P.S.), the Master of Science (M.S.), and the Doctor of Philosophy (Ph.D.) in options of the graduate degree in Environmental and Resource Engineering. Requirements for entering the degree program in Environmental and Resource Engineering are described under Division of Engineering.

Students are accepted into our programs from a variety of backgrounds. When the Department of Construction Management and Wood Products Engineering (CMWPE) reviews an applicant's academic and professional experience, it may determine that preparatory coursework is required before entry into the program. Either undergraduate or graduate courses may be recommended to remedy deficiencies depending on circumstances. Remedial coursework should be completed prior to matriculation. Undergraduate courses do not meet the requirements for minimum number of graduate credit hours. The student's study plan (Form 3B) must be approved by the steering committee and department chair by the end of the first semester in residence.

Students planning to obtain graduate degrees in the construction management option should have completed the following undergraduate coursework:

- Mathematics through Calculus II
- Physics: one semester with laboratory
- Engineering Mechanics: Statics

- Mechanics of Materials
- Soil Mechanics and Foundations I
- Estimating: coursework or professional experience
- Scheduling: coursework or professional experience

The purpose of the M.P.S. degree is to update current professional skills and/or to prepare the graduate student for higher levels of management in their general area of expertise. The M.P.S. degree is intended to be a terminal degree, therefore acceptance to the M.P.S. degree in construction management or wood products engineering does not guarantee admission to the M.S. or Ph.D. programs and *vice versa*. The M.P.S. degree requires 27 credits of graduate-level coursework, a 3-credit practicum based on professional experience, and a capstone seminar. Recommended course lists are available in the department office.

The CMWPE option in environmental and resources engineering offers areas of study in:

Construction and Construction Management (M.S., M.P.S., Ph.D.)

Participating Faculty: CROVELLA, KYANKA, MORSI-HUSSEIN, SMITH, J., TISS

- Construction project management
- Estimating, cost engineering, building codes and zoning
- Lean construction
- Green construction
- Production management
- Computer graphics and computer applications in engineering
- Structural design

This area of study is for students who plan to specialize in construction management or structures and materials science. Studies depend upon the student's previous education, professional objectives and interests. Recent graduates have matriculated upon completion of undergraduate degrees in architecture, mechanical engineering, construction management, and civil engineering.

Engineered Wood Products and Structures: Timber Structures Design (M.S., Ph.D.)

Participating Faculty: CROVELLA, KYANKA, MORSI-HUSSEIN, SMITH, J.

- Materials science
- Engineering mechanics and elasticity
- Engineering properties of wood composites
- Computer-aided design
- Static and dynamic properties of wood

The behavior of wood and wood-based components under loads and the effects of duration of the loads are critical elements when developing engineering codes. Wooden components as small as dowels or as large as bridge beams are considered, using elements of materials science, engineering mechanics and structural engineering. Basic property knowledge, employing theories of elasticity, viscoelasticity and fracture mechanics, is coupled with computer-aided design data to analyze the performance of wood and to solve application problems, such as those encountered in wood-frame construction and timber utility structures. How such factors as chemical fire retardant treatments, adhesive performance and mechanical fastener design interact with use requirements is considered. National and

international design codes and their development play an important role in specifying research areas of current interest and need. Fabrication and testing of actual components such as trusses, composite beams, and furniture connections are completed in the department's Wood Engineering Laboratory.

Students entering this program should have a strong background in integral calculus, statics, mechanics, and mechanical and physical properties of wood.

Tropical Timbers (M.S., Ph.D.)

Participating Faculty: ANAGNOST, MEYER

- Identification keys and systematics
- Wood properties and end use suitability
- Life zone analyses
- Expert systems

Studies in tropical timbers take many forms, depending on individual student interests. Often students from other countries bring specific problems and materials with them, so their thesis will find immediate application when they return home. The holdings of the C. deZeeuw Memorial Library and reference wood specimens of the H.P. Brown Memorial Wood Collection of the Tropical Timber Information Center (TTIC), housed in Baker Laboratory facilities, are vital to this work.

Research topics may be formulated to answer questions dealing with anatomy, identification, properties or uses of various woods from around the world, using the TTIC reference materials. These studies may be quite narrow, such as anatomy and physical properties of woods from a particular region, or much broader, such as regional distribution of species and species groups based on life zone research throughout a country or larger geographic area.

Wood Science and Technology (M.S., M.P.S., Ph.D.)

Participating Faculty: ANAGNOST, HANNA, KYANKA, MEYER, MORSI-HUSSEIN, SMITH, W.

- Adhesives and finishing
- Processing and machining
- Mechanical and physical properties
- The effects of wood anatomy on the physical and mechanical properties of wood
- Wood biodegradation
- Wood composites
- Dendrochronology

Because wood is renewable, it will meet the needs of modern society for a perpetually available, carbon dioxide-neutral material perfectly suited for a vast array of products. The study area wood science and technology includes detailed research on physical, mechanical, or anatomical aspects of wood and its utilization and leads to the M.S., M.P.S., or Ph.D. degree. Wood science stresses research on the material science of wood, dealing with properties important to its use, or to solve problems in wood utilization by practical applications of such knowledge.

Students entering this program should have an undergraduate degree in wood science or a related area.

Wood Anatomy and Ultrastructure (M.S., Ph.D.)

Participating Faculty: ANAGNOST, HANNA, MEYER

- Wood formation and cell wall organization

- Cytoskeleton of plant cells
- Properties related to anatomy and ultrastructure
- Electron, light and video microscopy

This area requires students to develop an extensive background in all aspects of microscopy: light, scanning electron, transmission electron, video microscopy and image analysis, including micro-techniques for effective preparation of specimens for the appropriate instrument. Wood anatomy studies are basic to wood identification, wood utilization, and physical/mechanical properties. These studies may include woods from other continents.

The field of ultrastructure is very broad with applications in many biological, chemical and materials sciences. Applied to wood, it emphasizes the sub-light microscopic structures (smaller than 0.2 micrometers) found in this natural material, either in the mature form or in its formative stages where various organelles of the living cell may be studied for their roles in producing the mature wood cell.

The behavior of wood in its many applications can be observed and explained via microscopy and related instrumentation such as EDXA (energy-dispersive x-ray analysis). State-of-the-art resources and facilities are concentrated in the Center for Ultrastructure Studies, which provides instruction and research support staff.

Students entering this program should have an undergraduate degree in wood anatomy or the biological sciences.

Wood Treatments (M.S., Ph.D.)

Participating Faculty: ANAGNOST, SMITH, W.

- Wood-water relationships and wood drying
- Preservative treatments
- Polymer treatments
- Sealants and coatings

Graduate study in the area of wood treatments allows the student to investigate the scientific basis for the improvement of wood and wood products with various treatments, which include drying, preservative treatments and coatings. Preparation for research includes graduate coursework in wood-water relationships and transport processes and additional study in areas such as wood anatomy and ultrastructure, mechanical properties, wood chemistry, wood microbiology, thermodynamics, and engineering economics.

Current research interests include use of innovative techniques to dry and preserve wood, effects of drying method on the subsequent treatability of wood, evaluation of energy usage in lumber drying technologies, improving wood properties with polymer treatments, and moisture migration studies.

Students entering this program should have an undergraduate degree in wood science or a closely related field.

Facilities

A major renovation to the teaching and research laboratories in Baker Laboratory is completed with a computer facility for estimating, scheduling, project management, wood engineering design, computer-aided design and drafting, finite element analysis and other specialized software. The Wood Products Engineering Laboratory TL-317 (WPEL), is an IAS accredited laboratory (ANS/ISO/IEC 17025:2005) for mechanical testing and includes a wide range of equipment for mechanical testing

and wood processing, including electronic data acquisition capabilities, a dry kiln, wood preservation equipment, a wood machining lab, and sawmill.

Construction Management facilities for research and teaching include laboratories for construction safety, building materials and green construction. A dedicated computer laboratory, the Construction Management Laboratory, provides specialized software for construction estimating, scheduling, project management, wood engineering design, computer-aided design and drafting, finite element analysis and other specialized software.

The C.J.K. Wang Wood Biodegradation Laboratory includes mycology culturing facilities and a modern molecular analysis laboratory; research microscopes, image analysis system and wood microtechnique equipment.

One of the largest wood collections in the world, the H. P. Brown Memorial Wood Collection is used to support the graduate research program of the Tropical Timber Information Center. The center also maintains the Carl deZeeuw Memorial Library.

A complete microscopy and image analysis laboratory is provided by the N.C. Brown Center for Ultrastructure Studies. This equipment includes a transmission electron microscope, scanning electron microscopes with energy dispersive x-ray analysis and particulate analysis accessories, and a wide variety of light microscopes equipped with image enhancement and various video image analysis capabilities. Graduate students using this equipment have the best available systems to relate the macroscopic behavior of wood to its anatomical characteristics.

The Renewable Materials Institute conducts research in the broad area of sustainable development of wood resources and the uses of wood products.