1982

Academic Catalog Volume 9: 1979-80 to 1981-82

State University of New York College of Environmental Science and Forestry

ANNOUNCEMENT
OF COURSES

GRADUATE AND
UNDERGRADUATE

STATE UNIVERSITY
OF NEW YORK
COLLEGE OF FORESTRY

Vol. 9

1979-80
TO
1981-82

1979 - 80

General Catalog

SUNY
COLLEGE OF
ENVIRONMENTAL SCIENCE
AND FORESTRY

CORRESPONDENCE DIRECTORY

Detailed information about the College may be obtained by addressing inquiries to:

The State University of New York
College of Environmental Science and Forestry
Syracuse, New York 13210
(315) 473-8611

Admission (Undergraduates)
Director of Admissions
110 Bray Hall
473-8708

Graduate Studies
Office of Academic Programs
219 Bray Hall
473-8631

Financial Assistance
Coordinator of Financial Aid
109 Bray Hall
473-8884

Transcripts and Academic Records
Registrar
111 Bray Hall
473-8717

Housing
Coordinator of Undergraduate Housing
Office of Residential Life
Steele Hall
Syracuse University
Syracuse, New York 13210
423-2720

Additional information is available upon request from any of the above addresses. This undergraduate/graduate catalog was published by the College of Environmental Science and Forestry, August 1979.

The calendar, courses, tuition and fees described in this catalog are subject to change at any time by official action either of the State University of New York Board of Trustees or of the College of Environmental Science and Forestry.

The State University of New York College of Environmental Science and Forestry does not discriminate on the basis of race, sex, religion, national origin, age, handicap, or marital status in admissions, employment, and treatment of students and employees.

State University of New York

COLLEGE OF

ENVIRONMENTAL SCIENCE AND FORESTRY

1979-80

General Catalog

TABLE OF CONTENTS

ACADEMIC CALENDAR 3

ESF: WHAT'S IN A NAME? 5

THE MISSION: INSTRUCTION, RESEARCH, AND PUBLIC SERVICE .. 8

THE CAMPUSES 15

THE SYRACUSE METROPOLITAN AREA 21

ACADEMIC LIFE 23

Undergraduate Admission 24

Admission Procedures 24

Graduate Admission 27

Expenses 28

Financial Assistance 32

Academic Requirements 37

Student Life 40

Degree, Programs and Areas of Study 45

GRADUATE EXCHANGE PROGRAMS 120

COURSE OFFERINGS 123

STATE UNIVERSITY OF NEW YORK 175

COLLEGE TRUSTEES AND ADMINISTRATION 178

COLLEGE FACULTY AND PROFESSIONAL STAFF 180

INDEX 194

CAMPUS LOCATOR .... Inside Back Cover

Academic Calendar

SYRACUSE CAMPUS

FALL 1979

Registration	September 5-6	Wednesday-Thursday
First Day of Classes	September 7	Friday
Yom Kippur (no classes)	October 1	Monday
Thanksgiving Vacation	November 21-25	Wednesday-Sunday
Last Day of Classes	December 14	Friday
Exam Period	December 17-21	Monday-Friday

SPRING 1980

Registration	January 15-16	Tuesday-Wednesday
First Day of Classes	January 17	Thursday
Spring Recess	March 8-16	Saturday-Sunday
Last Day of Classes	April 30	Wednesday
Reading Day	May 1	Thursday
Exam Period	May 2-8	Friday-Thursday
Commencement	May 10	Saturday

ESF: What's In A Name?

1911. Governor John A. Dix signed a bill establishing the New York State College of Forestry at Syracuse University.

1948. Legislative action incorporated into State University of New York all state-supported higher education. Thus, the State University College of Forestry at Syracuse University.

1972. By special legislative act, the College was renamed the State University of New York College of Environmental Science and Forestry.

Why, in the first place, all the name changes? And, secondly, what difference do they make? What, really, is in our name?

ESTABLISHING A TRADITION

While a professional forestry education in this country is almost entirely a development of the twentieth century, its primary roots can be traced back as early as 1862 when Congress passed the Morrill Act establishing a system of land-grant colleges.

The growing importance of forests in America's economy was reflected in the 1870 census, when, for the first time, information on forest resources was included. Several attempts to establish a national school of forestry were made; while none was approved, the movement shows that there was considerable demand for professionally trained foresters.

By 1900 there was a spirit of reform in the country—the same spirit that produced the early muckrakers also produced a generation interested in the conservation, preservation and careful management of precious natural resources. Between 1903 and 1914, 21 schools of forestry were established.

The first college of forestry in this country to offer a full, four-year undergraduate program was established in 1898 at Cornell University. Under the leadership of Bernard E. Fernow, students were introduced to critical field experience in their junior and senior years at the college's 30,000-acre forest in the Adirondack Mountains. There, Fernow taught many experimental management practices, including clear-cutting and surface-burning. These techniques have always been controversial, and they aroused criticism by the wealthy summer residents in adjacent areas of the Adirondacks. After only five years of operation, the Cornell College of Forestry was closed in 1903 when the state Legislature, yielding to the influential property owners, ended fiscal support.

The beginnings and early development of the New York State College of Forestry were largely due to James R. Day, chancellor of Syracuse University, and community leaders who were attuned to the growing national

sentiment favoring forest conservation and who sensed the need for a professional school of forestry. The legislative act which created the College instructed that the institution "conduct such special research in statewide investigations in forestry as will throw light upon and help in the solution of forestry problems. . ." and that it be "the institution for educational work in forestry in the State."

From the very first years of its existence under the first dean, Hugh P. Baker, the College responded to the broad needs of environmental professionalism. While other schools and colleges of forestry became more specialized, the College at Syracuse broadened to include the essentials of environmental science: design, engineering, and the life sciences, as well as resource management.

BROADENING THE BASE

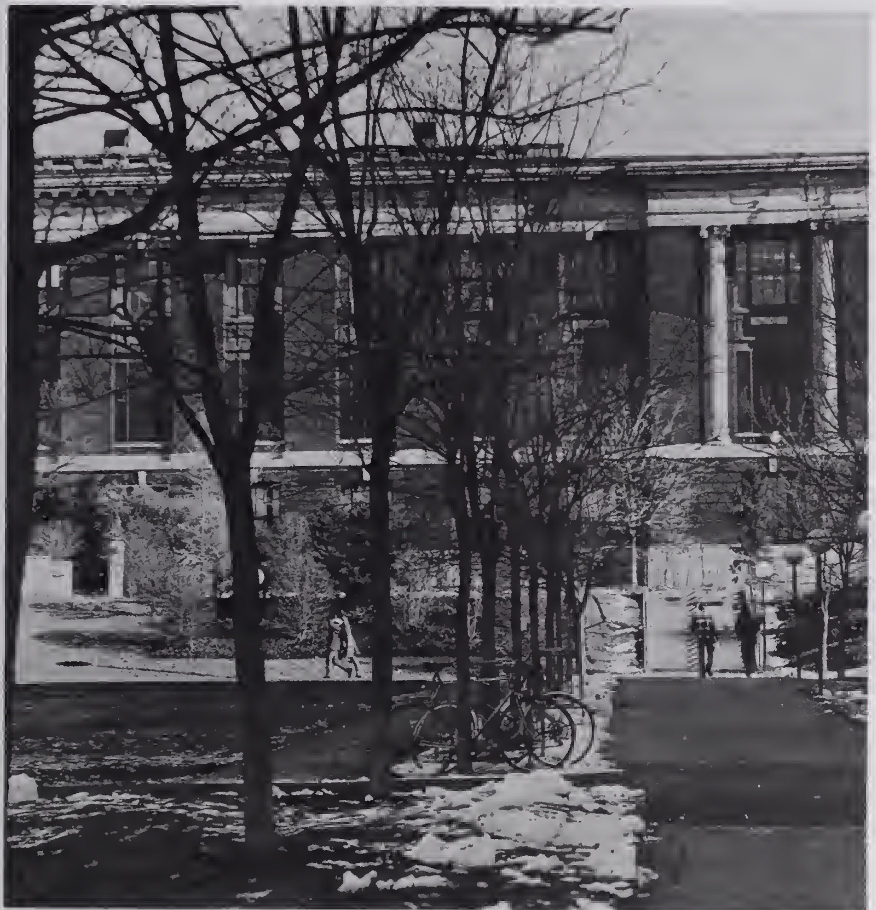
With the formation of the State University of New York in 1948, coordination and systematization came to higher education in the state. The University, according to its charter, was to "supplement, not supplant, the great network of private colleges and universities." The College of Forestry, which from its beginning had been state-supported and governed by a Board of Trustees currently made up of nine members appointed by the Governor and six *ex officio* members, was recognized as a specialized college within the State University system.

Stemming from Chancellor Day's early sponsorship of the College, Syracuse University and ESF have long been engaged in numerous fruitful devices of institutional cooperation. This relationship is probably the most outstanding example in this country of collaboration between public and private institutions of higher education. Even as a part of State University, the College maintains this unique position. The major character of the relationship stems from the fact that since its beginning, the College purchased from Syracuse University the major portion of its supportive and enrichment instruction, thus allowing the College to more fully develop its professional upper division and graduate level instruction.

Other cooperative areas are living centers and dining facilities, athletic programs, the use of the University's infirmary and health counseling services, the bookstore facilities, the University library system, and participation in numerous social activities including the elaborate religious, dramatic, and cultural benefits of a large university.

ESF TODAY

The third phase in the evolvement of the College's name came in 1972 when it was rechartered as the State University of New York College of Environmental Science and Forestry. Thus, the name reflects more deeply the traditional grounding and concern of forestry in the environment; it illuminates more clearly the capabilities of its program.



The College of Environmental Science and Forestry has completed a plan, conceived more than 10 years ago, to achieve complete upper division/graduate status. Undergraduate students wishing to embark upon a career in the environmental sciences and forestry will enroll for two years at a junior college or four-year institution, studying an ESF prescribed program and transfer to this college as juniors. The move to upper division/graduate college status marks another step in the College's long-standing commitment to educate professionals capable of facing the complex environmental problems of today and of the future.

For nearly 70 years, the full thrust of the State University of New York College of Environmental Science and Forestry has been focused on the environment on all of its six campuses and in each of its three mission areas—instruction, research, and public service. The College has been, and continues to be, devoted to the advancement of environmental science and forestry.

The Mission: Instruction, Research, and Public Service

INSTRUCTION

Undergraduate Education

In the fall of 1978, student enrollment reached 1,891. Of this number, 1,488 were undergraduates and 403 were graduate students. In addition, there were 25 students engaged in postdoctoral work.

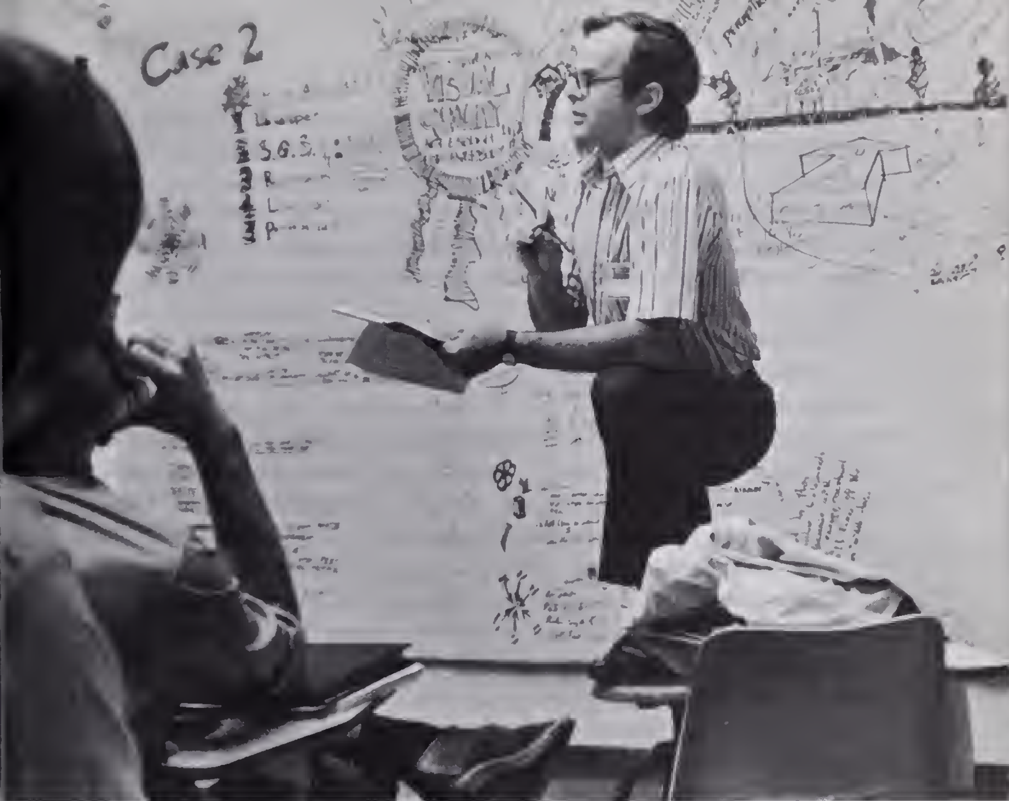
At the baccalaureate level, the College offers professional study in seven four-year curricula: (with options in biochemistry and natural products, environmental chemistry or natural and synthetic polymer chemistry); *forest engineering, paper science and engineering, wood products engineering* (with options in building construction or forest products), *resource management*, and *landscape architecture*. These programs are registered with the New York State Education Department.

Each of these curricula leads to the bachelor of science degree. In the case of landscape architecture, an additional year of study results in a bachelor of landscape architecture degree, and in the forest engineering program, a fifth year leading to a bachelor's degree in civil engineering can be taken at Syracuse University or State University at Buffalo.

Graduate Education

The College awarded its first graduate degree in 1913. Today the College offers advanced degrees in seven major program areas: *environmental and forest biology, chemistry, resource management and policy, silviculture and forest influences, environmental and resource engineering, landscape architecture, and environmental science*. These programs are registered with the New York State Education Department.

Graduate study leads to the master of science degree, the master of landscape architecture degree, and the doctor of philosophy degree. A postdoctoral study program, closely related to the College's research effort, is also available.



Technical Education

At the paraprofessional level, the College has been training forest technicians since 1912 at its Wanakena Campus in the Adirondack Mountains. It is the oldest Ranger School in the United States and offers a two-year *forest technology* curriculum. Graduates are awarded an associate in applied science degree. In the new curriculum, students take their first year of general education at an accredited two- or four-year college. The second year, with its emphasis on practical field training in the relationships between forest technology and managerial needs, is taken at Wanakena with its 2,800 acres of forested land. Graduates of this degree program in practical forestry are prepared for positions as forest rangers; federal, state, and private industry forest technicians and forestry aides; district forest supervisors; timber inventory specialists; timber sales supervisors; forest surveyors and engineering aides; and forest protection technicians.

Continuing Education

The philosophy that education is a lifelong pursuit is an ancient one and was written into the law creating the College. This concept is doubly important to the sciences and professions in this technological age when, with knowledge expanding in all directions, major environmental problems still remain to be resolved. The informational needs of New York's citizens also are undergoing change. The increasing urban character of our population; the changing pattern of agricultural and forest land ownership and use; the rise in level of education and sophistication in a more efficient society; and the increase in leisure time, travel mobility and need for recreational facilities and pursuits all contribute to a growing need for educational opportunities in environmental science and forestry for adult audiences.

The College has, over the years, succeeded in communicating knowledge on forest resources management, utilization, and conservation to a variety of off-campus publics. The entire College faculty has contributed to these programs. To reinforce this commitment, the College established a School of Continuing Education upon which to base expanded educational opportunities at both the undergraduate and graduate course levels.

Conferences, symposia, seminars, and shortcourses on various aspects of forestry and the related sciences are conducted at both the basic and applied levels. Audiences include forest owners, managers, and operators; wood engineers and forest industries personnel; academic and scientific groups; conservation and recreation personnel from local and other public and private planning groups; and citizen-action committees. Upon request, continuing education programs can be designed to meet specific needs of professional organizations, agencies, and industry. Credit or noncredit courses, at campus or off-campus sites, can be arranged.

Expansion of "in-service" training courses, establishment of "environmental learning centers" on College forest properties, and production of media materials for public information and education are examples of activities directed toward updating and upgrading professional clients and broadening the public's awareness and appreciation of New York's forestlands and other natural resources.

For information on specific continuing education projects, inquiries should be sent to Dean, School of Continuing Education.

RESEARCH

The College's commitment to scientific inquiry stretches far back to its second year of existence. In 1912, Dean Hugh P. Baker initiated the first research project of the College by joining forces with the U.S. Forest Service in an industry study designed to show what kinds of firms were using wood in New York State and the species and quantities of lumber they used.

In the 1970's, the College's research program has attracted a worldwide clientele of industrial, governmental, professional and scientific groups, and through liaison with them, the program maintains its vigor and relevancy to the important environmental issues of the decade. Support from this clientele amounts to about $3.2 million a year, an increase of 170 percent in the last decade.

Students and faculty from across the College contribute to the depth and diversity of the research program. Findings from these studies are applied to a host of issues and problems through various demonstrations and information devices. Recent examples include studies of limestone quarry reclamation; the development of polymeric materials for artificial human organs; nonchemical control measures for insect pests, e.g., the gypsy moth; studies of the ecology of Antarctic birds; new wood pulping processes leading to pollution-free water and air effluents; and the ecological effects of winter navigation in the Great Lakes and the St. Lawrence River.

The Institute of Environmental Program Affairs

The Institute of Environmental Program Affairs (IEPA), created at the College in 1972, is an umbrella-like structure that coordinates the overall research effort of the College with the efforts of other academic institutions, public agencies and private industries for a concerted attack on compelling and complex environmental problems. IEPA expands the College's ongoing examination of its appropriate role as a leader in environmental education for the 1970's and beyond in face of urgent appeals for multidisciplinary approaches, for problem-oriented task forces by both faculty and students, and for the greater application of higher education to society's needs. Because it is a process, the Institute preserves the identity of each collaborator: institutions, faculty members and students come together for just as long as necessary to solve a problem, then return to other ongoing areas of interest. Important projects have included: resource and environmental studies for the St. Lawrence Eastern Ontario Commission, and the Tug Hill and Catskill study commissions; a study of wetlands evaluation systems for the Adirondack Park Agency; development of environmental impact assessment guidelines for the New York State Department of Environmental Conservation; a study of selected environmental impacts of possible nuclear power developments in New York State for the Argonne National Laboratory; and studies of the St. Lawrence River ecosystems and impacts of oil spills and extension of the shipping season for the U.S. Environmental Protection Agency and the U.S. Fish and Wildlife Service, respectively.

Additional projects include an analysis of the effects of acid precipitation on terrestrial ecosystems, reclamation studies of mines and quarried lands, and biomass potentials for energy production. Work is also anticipated in the areas of stream channel response to land use changes and social and political factors affecting disposal of sewage on land areas.

Empire State Paper Research Institute

The Empire State Paper Research Institute (ESPRI), located on the main campus, is the only worldwide basic research organization in the pulp and paper field. It performs investigations in cooperation with the Empire State

Paper Research Association (ESPRA), which is comprised of 75 pulp and paper companies in 12 countries. The Institute was established in 1945 when the members of ESPRA recognized the need for new scientific and technical knowledge and methods, and since then ESPRI has been able to maintain an efficient balance between the practical and theoretical bases of the pulp and paper industry.

Housed in the modern J. Henry Walters Hall with its own pilot paper mill, and staffed by scientists who are internationally recognized for their accomplishments, ESPRI provides a research base for long-range industry development. Its program has widened in scope to cover almost all aspects of pulping and papermaking, including additive retention, oxygen pulping and bleaching, effluent control, sheet drying, printability, and energy efficiencies.

State University Polymer Center

In 1966 the College's polymer research institute was designated as the State University of New York Polymer Research Center in order to stimulate University-wide interest in polymer chemistry.

Scientists at the College have made many original contributions to the field of pure and applied polymer chemistry, including the development of living polymers, the study of anionic polymerization and electron-transfer initiation, and work on the permeation of gases and films through polymeric films.

College faculty members specializing in polymer chemistry have trained several hundred graduates and postdoctoral researchers, many of whom now hold leading positions in universities and industrial and governmental laboratories.

U.S. Department of Agriculture—Forest Service Cooperative Research Unit

The Northeast Forest Experiment Station of the U.S. Department of Agriculture-Forest Service maintains a research center at the College. Until 1977, this unit pursued studies of forest-centered recreation with the aim of developing improved methods for integrating recreation and other uses of forests.

Beginning in 1978, the Cooperative Research Unit was re-oriented to research on urban environmental forestry problems. This provides increased opportunities for faculty and students to collaborate with Forest Service scientists in studies of a variety of urban and environmental problems.

Nelson Courtlandt Brown Laboratory for Ultrastructure Studies

This Center, located in Baker Laboratory, is a teaching, research, and service facility of the College. It is equipped to handle virtually every type of modern microscopy. This includes light, scanning electron, and transmission electron microscopy. Among the major items of equipment are: two RCA EMU-3 transmission electron microscopes; an RCA EMU-4, an ETEC Autoscan scanning electron microscope, energy dispersive X-ray analyzer, several types of light microscopes, high vacuum evaporators, microtomes and ultramicrotomes. The laboratory resources include specimen preparation rooms, several photographic darkrooms, three electron microscope laboratories and other supporting facilities.

The primary service of the Center is teaching; course offerings include photomicrography, scanning electron microscopy, and interpretation of cellular ultrastructure. Research is a second major activity since support is provided for students, faculty, and research staff who have projects involving structural studies. Public service is extended to local high school groups, medical facilities, other regional colleges and universities, and industry.

Adirondack Ecological Center

The Adirondack Ecological Center (AEC) is located on the College's Newcomb Campus in the center of the Adirondack Mountains. Staffed by resident scientists, technicians, and support staff, the AEC conducts studies of the Adirondack region year-round. Research includes studies of managed and unmanaged forest lands, wildlife populations and habitats, terrestrial and aquatic ecology, and wilderness management. Work is carried on in close collaboration with the New York State Department of Environmental Conservation, the U.S. Fish and Wildlife Service, the U.S. Department of Agriculture, and forest industries.

The vigorous research program of the Center provides excellent opportunities for collaboration by Syracuse-based faculty and students. Several graduate students are regularly in residence at Newcomb pursuing their thesis research.

PUBLIC SERVICE

The College, throughout its 67-year history, has continued to respond to its specific legislative mission prescribing major responsibilities in the area of public service. Public education and information, technical advice and guidance to cooperating local, state, and federal agencies and organizations, and technical assistance to the forest and wood-using industries constitute the principal formal public service activities. The Institute of Environmental Program Affairs (described in the Research section) coordinates the College's public service activities on the professional level.

While the list of public service contributions is lengthy, a few examples include: the College's Film Library; the Tree Pest and Disease Service, which provides technical advice to private citizens and to governmental agencies; and the participation of ESF faculty members in Central New York's Poison Control Center. Altogether, the public service programs of the College reach approximately one million New York State residents each year.

The Campuses

The College operates a multiple campus system with regional campuses and field stations located at Syracuse, Tully, Wanakena, Warrensburg, Cranberry Lake, Newcomb, and Clayton. This system is composed of about one million square feet of facilities in 179 buildings and 25,000 acres of land. Collectively, they represent the largest fully-utilized campus in the world.

THE SYRACUSE CAMPUS

The main campus is in Syracuse and lies on 12 acres adjacent to Syracuse University in an area that traditionally has been known as "The Hill." Located here are the Schools of Biology, Chemistry, and Ecology; Environmental and Resource Engineering; Forestry; Landscape Architecture; and Continuing Education. In addition, the main campus houses the Institute of Environmental Program Affairs, the Empire State Paper Research Institute, the State University Polymer Research Center, a cooperative research unit of the U.S. Forest Service, and an ultrastructure center.

These program units are housed in five major academic buildings (Baker Laboratory and Walters, Bray, Marshall and Illick Halls). The administrative headquarters of the College is located in Bray Hall. The main campus also embraces Moon Memorial Library, the Maintenance Building and several other small service and storage facilities.

Specialized facilities at the Syracuse campus include electron microscopes, plant growth chambers, air-conditioned greenhouses, an animal environmental simulating chamber, a bio-acoustical laboratory, a 1,000-curie cobalt-60 radiation source, radioisotope laboratory, computer center, and specialized instrumentation including nuclear magnetic resonance spectrometer, electron spin resonance spectrometer, mass spectrometer, ultracentrifuge, and X-ray and infrared spectrophotometer. Photogrammatic and geodetic facilities of the forest engineering department include one of the most extensive arrays of equipment in the United States, with a Nistri TA-3 stereocomparator, Mann comparator, computerized Nistri photocartograph, and nine other varieties of plotters. The paper science and engineering laboratory has a semicommercial paper mill with accessory equipment. The wood products engineering department has a complete strength-of-materials laboratory as well as a pilot scale plywood laboratory and a machining laboratory. The greenhouses and forest insectary are used to produce plant and insect material for classroom and laboratory. Extensive collections are available for study, including wood samples from all over the world, botanical materials, insects, birds, mammals, and fishes.

The **F. Franklin Moon Library** contains more than 71,000 cataloged items. Over 800 journals and corresponding indices are currently received. The collections constitute an information center for forestry and environmental science programs in ecology, botany and pathology, biochemistry, chemical ecology, forest chemistry, polymer chemistry, economics, entomology, environmental studies, industrial pollution abatement, landscape architecture, environmental design, management, paper science and engineering, photogrammetry, silviculture, soil science, water resources, world forestry, wildlife biology, wood products engineering, and zoology. These are supplemented by large collections in the environmental resource field. Additional strength is found in the comprehensiveness of abstract and indexing services relevant to the College's programs. The library also offers a broad choice of general interest reading material.

The collections of Syracuse University libraries and State University Upstate Medical Center are within walking distance. They may be used by all members of the College of Environmental Science and Forestry. Arrangements often can be made to use industrial libraries in the Syracuse area. Other collections are accessible through the Inter-library loan privilege.

The library building, opened in 1968, can accommodate 132,000 volumes and can seat 575 persons. The main reading areas are in the center of the upper level surrounding open stacks. The library contains a current periodicals room, bibliographic center, individual study carrels, and library staff offices. The archives, special collections, conference rooms, autotutorial center, and informal study rooms are located on the lower level.

The autotutorial center provides facilities for study with nonbook materials. Slides and cassettes prepared as integral units of particular courses are held on reserve for use in the center. Materials are available for review on weekends, evenings and times when other facilities are closed.

Leisure reading material, distributed throughout the total collection, represents the Robin Hood and Raymond F. Crossman collections, which contain books on national and world social problems, humanities, education, and popular books concerned with the environment. The archives consist of historical items relevant to the College and forestry developments in New York State. The special collections room contains rare and valuable books and folios.

Reference service, orientation, and bibliographic instruction (Library Research 300) are provided by the librarians. Study guides, user aids, and other such publications are prepared and distributed by the librarians as needed.

The **Educational Communications** unit directly supports the program areas of the College through development and application of media materials and methods for the classroom, for the presentation of research findings, and for public service endeavors. These include television programming, slide/tape and motion picture production and photographic services. Other services to the College community include engineering, audio-visual equipment distribution, and maintenance and support functions. The Educational Communications staff also participates directly and actively in instructional programs in environmental communication at both the undergraduate and graduate levels, as well as through the School of Continuing Education.

The College **Computer Center** provides computational service via terminals connected to the Syracuse University academic computer facilities. Two computer systems are accessible—an IBM-370 model 155 used for batch processing and APL, and a large Digital Equipment Corporation DEC-KL10 used primarily for time-sharing applications. Computer usage can be classified into academic and administrative categories with the academic use amounting to 80 percent of the total College load. The major academic use is in the graduate programs where students investigate problems in areas such as hydrology, transportation networks, forest and tree growth studies, genetics, disease and insect behavior and controls, land use, production and processing techniques, polymer and cellulose chemistry, cellular ultrastructure, photogrammetry and remote sensing, landscape architecture, and other related and supporting fields.

THE TULLY CAMPUS

Located about 25 miles south of Syracuse is the Tully Campus which is composed of the Heiberg Memorial Forest and the Genetic Field Station.

Heiberg Memorial Forest is located on the northern escarpment of the Allegheny Plateau. It includes 3,800 acres of diverse terrain and forest growth. The Forest is utilized both as an extensive outdoor teaching laboratory and as a site for intensive research. The Forest Ecosystem Lab, which is a highly instrumented outdoor teaching laboratory; a large complex of all-weather classrooms; many experimental plantings, some from known seed sources from throughout the world; a commercial-scale maple syrup operation; and an experimental deer research area are among the developments on this forest. Each fall the Heiberg Memorial Forest is the site of an intensive program for environmental and resource management students in a total ecosystem approach to forest community management instruction.

The **Genetic Field Station** is located adjacent to the Village of Tully. It is in a particularly fertile area and is devoted to relatively short-term outplantings of plant materials developed in the various genetics research projects of the College.

THE WANAKENA CAMPUS

The Wanakena Campus is located on the Oswegatchie River, 65 miles northeast of Watertown and 35 miles west of Tupper Lake. This campus, with its large instructional and demonstration forest, supports the College's **School of Forest Technology**, the oldest forest technician school in the country. It is on this campus that forest technicians are trained in an associate degree program.

THE WARRENSBURG CAMPUS

The Warrensburg Campus is located in the southeastern Adirondack region and encompasses the Charles Lathrop Pack Demonstration Forest, an area of roughly 2,500 acres of heavily forested land noted for its white pine. The Forest has been under intensive management since 1927 for the combined purpose of instruction, research, and demonstration in forestry and allied fields.

Each year this campus hosts the Summer Session in Field Forestry, a five-week course devoted to introductory instruction in field forestry principles and techniques. The course is required of all entering students in Environmental and Resource Management and is open to election by students in Environmental and Forest Biology. Formal offerings in Continuing Education and various meetings and conferences are also held here for practicing professionals and organizations directly associated with forestry and allied environmental fields.

THE CRANBERRY LAKE CAMPUS

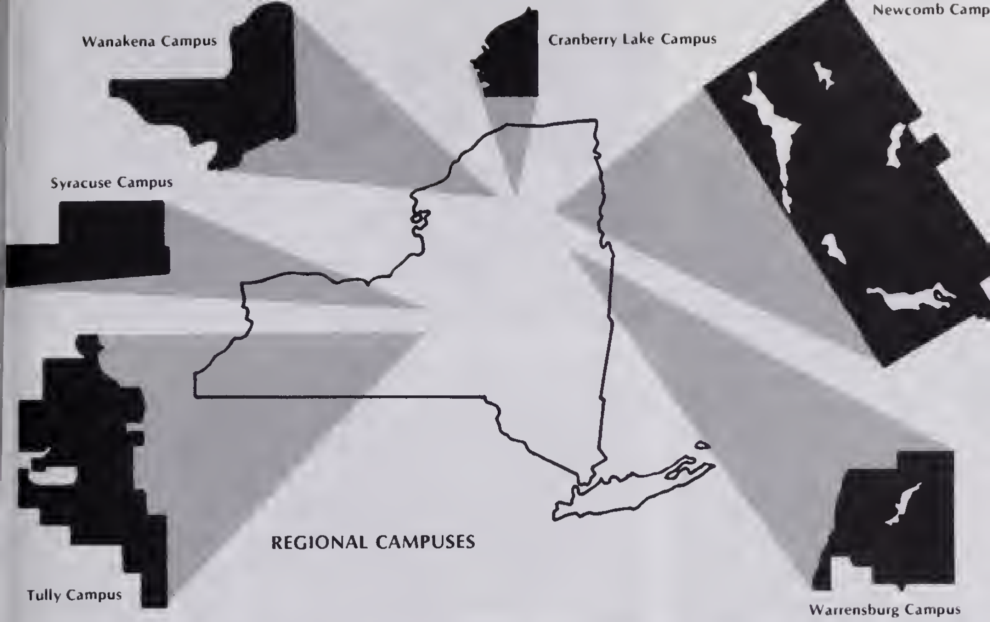
The Cranberry Lake Campus, accessible only by boat, is the site of the College's biological station, where, every year, a cooperative program in environmental biology is sponsored jointly by the College and other institutions of higher education. Bounded by 150,000 acres of forest preserve, by Cranberry Lake, and by isolated forest bogs and beaver meadows, the extensive facilities are intensely utilized in a comprehensive curriculum of upper-level and graduate courses.

THE NEWCOMB CAMPUS

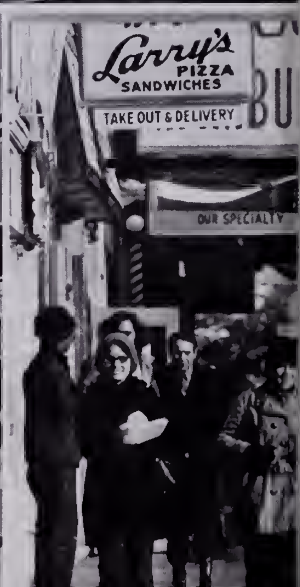
Located in the central Adirondack Mountains, Newcomb is the largest of the regional campuses and home to the **Adirondack Ecological Center** where extensive studies of animal biology and ecology are carried out. Located there also is **The Archer and Anna Huntington Wildlife Forest**.

THE FIELD STATIONS

In addition to its regional campus system, the College operates several field stations which directly support the programs of the institution. The 44-acre **Forest Experiment Station**, located only a few minutes drive from the main campus, is used to support main campus academic programs. Located at the Station are a large arboretum, tree nursery, and experimental greenhouse facility. Adjacent to the Tully Campus is the College's **Genetic Field Station**. With its irrigation system and layout of level blocks, it is an



excellent facility for developing hybrids, for grafting experiments, and for research in heritability. A magnificent island, the **Ellis International Laboratory**, is situated in the heart of the Thousand Islands—St. Lawrence River area off the village of Clayton. Accessible only by boat, this laboratory, which is the College's most recent property acquisition, is an unusually appropriate site for the College-wide, cooperative and international environmental monitoring and research activities.


Larry's
PIZZA
SANDWICHES
TAKE OUT & DELIVERY
OUR SPECIALTY

The Syracuse Metropolitan Area

The College of Environmental Science and Forestry is located on one of several hills that overlook Syracuse, a growing metropolitan area of nearly 500,000. Known as the "Salt City" because of the great salt industry which was centered here for more than seventy years, Syracuse is today a city of diversified industry and commerce. The area is a leader in the manufacture of china, quality shoes, air conditioning equipment, medical diagnostic equipment, drugs, automotive parts, and lighting equipment.

The City of Syracuse offers students many cultural, recreational and educational opportunities, including a symphony orchestra, several museums, live theater and historical points of interest.

Called the "Crossroads of New York State," Syracuse is one of the few cities in the nation situated at the crossing point of two major superhighways. It is located at the intersection of the 500-mile east-west New York State Thruway and the north-south Penn-Can Highway. Driving time from New York City, Philadelphia, Boston, Toronto and Montreal is about five hours; from Buffalo and Albany about three hours. The city is served also by a modern international airport and major bus and rail lines.

Academic Life

Society is increasingly in the hands of those who have broad foresight and a balance of judgment in applying scientific, sociological, and technical knowledge to guide human and environmental forces. Modern civilization—with its compelling demands from industry, government, and educational institutions—requires people who think objectively and constructively, and who act creatively and responsibly.

From its beginnings in 1911, the State University of New York College of Environmental Science and Forestry has served New York State and the nation in meeting the needs of its citizens in regard to the environment through education, research, and public service. The faculty and students of the institution are committed to the resolution of immediate environmental problems, the development of the knowledge necessary to predict occurrences in the future, and the presentation of public policy alternatives that will both protect the environment and accommodate the real needs of society.

At the undergraduate level, ESF offers curricula in the general areas of resource management, engineering, environmental design, and the life sciences that prepare graduates to enter and contribute to the professional world or to continuing their education at the graduate level, at ESF or elsewhere.

Graduate years are a time of discovery and excitement, a time of answers and new insights, a time of personal productivity and contributions to scholarship. It is during graduate education that the student sharpens the ability to think critically and analytically, to plan research, to design experiments, to work effectively with the basic research tools as well as specialized equipment, and to undertake the discipline of purposeful study toward a specific goal.

The College currently supports significant graduate degree programs in six discipline areas and in its broad program in Environmental Science, which encourages the development of multidisciplinary graduate research. Both undergraduate and graduate programs of the College reflect the work of its faculty and their student colleagues, who, together, utilizing some of the most modern facilities and laboratories in the country, maintain a long-standing tradition of academic and professional excellence.

This catalog provides an introduction to the College and its programs of undergraduate and graduate study and research. It only begins to suggest the diversity and depth of the existing and potential programs that make environmental science the challenge of the 80's and beyond.

UNDERGRADUATE ADMISSION

The College of Environmental Science and Forestry is an upper division/ graduate center, enrolling at the undergraduate level transfer students who have completed at least two years of postsecondary coursework in its undergraduate programs. High school seniors who have been accepted two years prior to their date of entry under the Advanced Early Admission Program transfer as juniors in the College after completion of program prerequisites.

Freshman and sophomore level courses may be taken at any accredited two- or four-year college or university; all students considering transfer to ESF as juniors should follow a prescribed program appropriate to their intended major at the College. Each curriculum offered at the College of Environmental Science and Forestry and listed in this catalog defines the required lower division courses necessary for admission. These requirements are listed in the Areas of Study section of the catalog.

Students who are certain they intend to transfer to ESF may enroll in established pre-environmental science programs organized by the College in cooperation with a number of two- and four-year colleges in and out of New York State. Students who attend these colleges will find a smooth articulation has been established and upon successful completion of these prerequisites will generally gain admission to the college with full junior status. It is not required to specifically attend one of these colleges; a student may obtain the necessary lower division courses at almost any college or university in the country.

Application to ESF's associate degree program in Forest Technology at the Wanakena Campus must be made one year in advance. Therefore, high school students desiring to attend the Wanakena program in 1981 must apply this year. For further information on ESF's School of Forest Technology, see page 105, or contact the Office of Admissions.

ADMISSION PROCEDURES

ADVANCED EARLY ADMISSION PROGRAM

High school students who are strongly motivated toward attending ESF may apply to the College of Environmental Science and Forestry during their senior year under the *Advanced Early Admission Program*.

Those seniors whose academic background is successfully competitive will receive a letter of acceptance to the College for entrance two years later with full junior status, contingent upon successful completion of all prerequisite courses of the first two years of the curriculum they have selected and been admitted to. The prerequisite courses will be outlined and described in an enclosure with the student's acceptance letter.

This early acceptance will alleviate much of the anxiety about admissibility as a result of the first two years of college. High school seniors will know prior to graduation if they have been accepted to the college for entrance at the junior level. It affords those accepted students the opportunity to attend any college of their choice that offers the lower division courses. SUNY applications for the Advanced Early Admission Program may be obtained from the high school guidance office or upon request from the Office of Admissions at ESF.

Students who are not competitive out of high school and are not granted admission under this program can easily improve on their record during the first two years of college, and we would be more than happy to consider their new record as a sophomore transfer for entrance at the junior level.

TRANSFER ADMISSIONS

For those students not accepted under the Advanced Early Admission Program, admission to the College of Environmental Science and Forestry is based on the student's previous college coursework, overall academic aptitude, and interest in the programs offered at this College. Consideration is given to both the quality and appropriateness of the student's prior academic experience. The minimum grade point average for acceptance is 2.0 (4.00 = A).

PRE-ESF COOPERATIVE TRANSFER PROGRAMS

The College, working in cooperation with other collegiate institutions, both in and out of New York State, has developed over 35 Pre-Environmental Science and Forestry Programs. The development of these programs illustrates that high school students can look forward to a wide selection of colleges in which they can obtain all the necessary lower division courses to transfer to ESF as full juniors.

These colleges represent the total spectrum of higher education (private, public, 4-year, 2-year) and are located in New York, Connecticut, Massachusetts, Iowa, New Jersey, Pennsylvania, and Rhode Island. Students who attend these colleges will find a smooth articulation has been established and once they transfer to ESF will share a common academic background with other transfer students.

For a list of the institutions participating in a Pre-ESF Program, students should contact the Office of Admissions.

TRANSFER CREDIT

Courses transferred for credit must be appropriate to the student's curriculum choice. Credit will be awarded for all such courses completed with a passing grade of "D" or better.

Furthermore, courses to be transferred as required courses in a curriculum must be acceptable in content. Course credit hours are transferred, but grades and grade points are not.

No transfer credit will be awarded until all final transcripts are received. It is the student's responsibility to see that this is done.

COLLEGE PROFICIENCY EXAMINATIONS

The New York State College Proficiency Examination Program (CPE) is a means by which students may receive college credit for specific courses by examinations, without being in residence for a course or taking structured correspondence lessons. College credit is generally awarded for a grade of "C" or better. The College also accepts credits from the College Level Examination Program (CLEP) of the College Entrance Examination Board.

EDUCATIONAL OPPORTUNITY PROGRAM

The basic goal of the Educational Opportunity Program at the College is to provide qualified students with a college education—the opportunity for personal growth and professional development. Upon completion of the program, graduates will be provided access to jobs in professional fields. The program is not designed for students who need only financial assistance. It serves students who ordinarily would not be able to attend college because of a lack of financial resources and insufficient academic preparation. To qualify, students must be New York state residents and demonstrate the potential to successfully complete the courses of study at the College.

Further information regarding the Educational Opportunity program may be obtained by contacting the Office of Admissions.

INTERNATIONAL STUDENTS

The College accepts international students on the undergraduate level if they can satisfy all regular admission requirements. It is recommended, however, that students from foreign countries obtain their baccalaureate degree in their home country, and apply to the College as graduate students. Experience has shown that this arrangement provides for greater academic achievement and more efficient use of the student's time and funds. International students applying for admission must satisfy all of the course prerequisites for their intended major. In addition they must:

1. Demonstrate proficiency in the English language through acceptable performance on the Test of English as a Foreign Language (TOEFL) and/or the College Entrance Examination Board (CEEB) Achievement Text in English, and
2. Produce evidence of their ability to meet all their financial obligations.

Undergraduate international students must file official State University of New York foreign student admission forms. No fee is required for processing the application. Prior to international student acceptance, adequate financial resources must be demonstrated, and after acceptance health and accident insurance must be obtained before the student will be allowed to register at the College.

International students who are currently at an American college may apply for transfer to the College. They must meet all entrance requirements of international students plus those of a transfer student as listed above. Permission to transfer must be obtained from the U.S. Immigration and Naturalization Service district office having jurisdiction over the college in which the student is currently enrolled.

HEALTH EXAMINATION BOARD

Each new student is required to submit a medical history and physical examination report on a form that will be sent after the initial acceptance notice.

GRADUATE ADMISSION

Admission to graduate study may be granted only to applicants with at least a bachelor's degree from a recognized institution and whose preparation has been suitable in quality and content for the proposed field of major study. Applicants will be evaluated on the basis of the following: (1) their academic record should show at least a B or 80 percent average for the junior and senior years; (2) Graduate Record Examination aptitude scores, and, in some cases, subject matter (advanced) tests indicative of graduate study ability (see below); (3) supporting letters of recommendation; (4) a statement of specific educational and professional goals which describes the choice of degree program and the students' plan for the pursuit of the objectives in the program; and (5) where appropriate, other evidence of scholarly achievement and potential. Admission is selective with priority given to applicants who have high scholastic standing.

ADVANCED TESTS

Subject matter (advanced) test scores are required by the following programs:

Graduate Programs	*Advanced Test*
Chemistry	Chemistry
Environmental and Forest Biology	Biology

PROCEDURE

All applicants are required to submit Graduate Record Examination aptitude scores. This examination is offered several times each year in major cities of the world. For information on registration and scheduling write to the Educational Testing Service, Princeton, New Jersey 08540. Test scores should be sent to the Office of Academic Programs, (Institutional number R2530).

The College provides a special application form for graduate work. Requests for information and applications should be addressed to the Office of Academic Programs.

INTERNATIONAL STUDENTS

Citizens of other countries with special educational objectives are accepted for graduate study in all programs. They must show satisfactory evidence that they have completed studies in their major field equivalent to those at a recognized American institution with a scholastic record equivalent to a B average in their junior and senior years. They must submit Graduate Record Examination scores as explained in the section on Admission Requirements. Also, applicants whose native language is other than English must submit scores on the Test of English as a Foreign Language (TOEFL). This requirement may be waived if the student has received a degree from an American institution. This examination is offered several times each year in major cities of the world.

For information on registration and scheduling, write to the Educational Testing Service, Princeton, New Jersey 08540, U.S.A. In submitting test scores, request that they be sent to the Office of Academic Programs.

EXPENSES

APPLICATION FEE

When a student applies for admission to an undergraduate program at any of the State University of New York units, a nonrefundable application fee of $9 is required. More information about the fee and guidelines for exemptions is provided in the "Application Guidebook" for the State University of New York. There is no application fee for those applying for graduate study.

ADVANCED PAYMENT FEE

All admitted undergraduate students pay a fee of $50, which is credited to the student's first semester tuition. This payment should be sent to the College Business Office accompanied by the form provided by the Office of Admissions. The payment is required prior to May 1, or 30 days after acceptance, whichever is later. It is refundable up to May 1, or within that 30-day period. There is no advanced payment fee required for those accepted for graduate study.

TUITION AND FEES

The tuition and fee structure of the College of Environmental Science and Forestry covers usage of library, infirmary, physical education facilities, ROTC, special testing, and other services, as well as an assessment for student activities and charges for expendable supplies and equipment.

Tuition is charged in the following rate per semester:

Tuition Type	NYS Resident Students	Out-of-State Students
Undergraduate Matriculated		
Full-time	450.00	750.00
Part-Time	30.00/credit hour	50.00/credit hour
Graduate Matriculated		
Full-Time	700.00	900.00
Part-Time	58.50/credit hour	75.00/credit hour
Students who do *not* hold a Baccalaureate Degree		
Course Nos. 100-599	30.00/credit hour	50.00/credit hour
Course Nos. 600-999	58.50/credit hour	75.00/credit hour
Continuing Education Non-Degree students who hold a Baccalaureate Degree		
Course Nos. 100-499	30.00/credit hour	50.00/credit hour
Course Nos. 500-999	58.50/credit hour	75.00/credit hour
Maximum Total Tuition for 12 credit hours or more	700.00	900.00

STUDENT ACTIVITY FEES

In addition to tuition, the student body has voted to assess each full-time undergraduate student $20 per year to cover the cost of student activities. Full-time non-matriculated students are charged a fee of $10 per semester, and part-time matriculated students $1 per credit hour. Full-time graduate students likewise have a mandatory activity fee of $15. ESF students also pay an activity fee to Syracuse University to cover SU-sponsored activities and services available to ESF students, not duplicated by College organizations. These fees are $24.75 for full-time undergraduate and $13 for full-time graduate students. Part-time matriculated students are charged $14.50 per year payable at fall registration; part-time matriculated graduate students are charged $8 per year.

COLLEGE FEE

There is a State University of New York general college fee of $25 per year for all full-time students. Part-time student fee is $.85 per credit hour.

COMMENCEMENT FEE

A commencement fee of $10 is required at the beginning of the semester in which the degree is expected. Additional costs are incurred by graduate students for the binding, abstracting, and microfilming of theses.

TERMS OF PAYMENT

A check or money order for tuition and fees should be made payable to State University of New York College of Environmental Science and Forestry. This payment is required by the last day of the registration period and can be paid at the College's Business Office either prior to registration or during registration. A fee of $10 is charged for registering later than the established date.

HOUSING AND BOARD COSTS

ESF does not operate student residences or dining halls. These facilities are offered by Syracuse University. Specific information about available housing and board plans is available from the Office of Residence and Dining Services, Syracuse University, Syracuse, New York 13210.

In general, housing costs at SU range from $970 to $1,300 for an academic year, reflecting the diversity of available accommodations for graduate or undergraduate, single or married students. Most dormitory rooms accommodate two students and are furnished with beds, mattresses, desks, chairs, study lamps and dressers. A commercial linen service is available to those who order it. Separate dormitories are maintained for graduate students.

Furnished and unfurnished apartments are also available for both single and married students. These are located in a housing complex approximately two miles from the main campus, and are regularly serviced by a free shuttle-bus.

A variety of options on board offerings are available for all students, whether or not they reside in University dormitories. Costs range from $860 to $1,070 for an academic year.

In addition, a wide variety of living arrangements in private homes and apartment complexes is available in the Syracuse metropolitan area.

Payment for housing and board is made directly to Syracuse University.

OTHER COSTS

Students majoring in Resource Management attend a five-week Summer Session in Field Forestry at the Warrensburg Campus between the sophomore and junior years. Forest Biology majors have the option of attending this session or the Summer Session in Environmental Biology at the Cranberry Lake Biological Station at the end of the junior year. Cost for either five-week session is approximately $300 plus travel and personal expenses.

An extended field trip of up to three weeks at the end of the junior year costs approximately $200 for Wood Products Engineering students.

Field trips for Landscape Architecture students range between $125 and $150. In addition, students enrolled in the five -year Landscape Architecture program are required to spend one semester off campus. This is a self-described and student-budgeted program. Costs do not necessarily exceed those of a semester on campus, but additional costs are often incurred depending upon the location chosen.

The cost of books and supplies is approximately $200 to $300 a year. Additional costs for personal expenses, recreation, clothes and travel depend on the individual, and they may range from $500 to $700 a year.

REFUNDS

The following policies apply to tuition liability and refunds for students canceling their registration.

A student who is given permission to cancel registration is liable for payment of tuition in accordance with the following schedule:

Liability During Semester	
1st week:	0%
2nd week:	30%
3rd week:	50%
4th week:	70%
5th week:	100%

Application for refund must be made within one year after the end of term for which the tuition was paid to State University. The first day of class session is considered the first day of the semester, and Saturday of the week in which this first session occurs is considered the end of the first week for refund purposes. It is interpreted that a student who does not attend any class sessions after Saturday of the first week and who notifies the College of his intent to cancel registration on or before the second Saturday following the first day of classes will be considered to have canceled his registration during the first week.

There is no tuition or fee liability established for a student who withdraws to enter military service prior to the end of an academic term for those courses in which the student does not receive academic credit.

A student who is dismissed for academic or disciplinary reasons prior to the end of an academic term is liable for all tuition and fees due for that term.

A student who cancels registration at a unit of the State University and within the same term registers at another unit of the State University is entitled to full credit for tuition and fees paid for that term.

Notwithstanding any other provisions for refund, when a student has withdrawn through circumstances beyond the student's control, under conditions in which the denial of refund would cause undue hardship, the Chief Administrative Officer of the unit may, at his discretion, determine that no liability for tuition has been incurred by the student, provided the student has not completed more than one half of the term and has not received or will not receive academic credit for the term. Such action, including the reason for withdrawal, must be in writing.

FINANCIAL ASSISTANCE

The College of Environmental Science and Forestry offers four basic forms of student financial assistance: scholarships or grants, part-time employment, long-term loans, and assistantships for graduate students. These programs are coordinated to supplement parental support, summer work, savings, and assistance from other sources. The sources of funds for financial assistance programs, the guidelines for determining the recipients, the procedures for applying, and the method of disbursement of funds vary from one program to another. This information is presented in detail in *Financial Assistance at ESF*, a separate publication which is mailed to all applicants, and is available to the public by contacting the Office of Financial Aid.

Financial aid advisors are aware of the many problems of financing higher education and meeting day-to-day living expenses for both undergraduate and graduate students, and are available to discuss individual student problems. All students are encouraged to apply for financial aid.

HOW TO APPLY

Each year students interested in receiving financial assistance, *except for graduate assistantships*, must complete the application process. (Graduate students who wish to be considered for a graduate assistantship refer to page 36, and follow those instructions.) Two forms are necessary to apply:

1. The candidate must complete a College Application for Financial Aid and return it to the Office of Financial Aid by MARCH 15. The application is included in the publication, *Financial Assistance at ESF*. Applications will be accepted after March 15; it should be noted, however, that available funds may already be committed to other students. Applicants need not wait for notification of acceptance to the College before applying for financial aid.

2. The candidate must also complete the Financial Aid Form (FAF) available in the College's Office of Financial Aid, high school guidance, and most college financial aid offices.

3. Students are invited to discuss with the professionals in the Financial Aid Office any problems in financing their education.

This application information is based on current requirements, and financial aid systems and forms are undergoing constant change. Applicants are urged to contact the Office of Financial Aid for the latest information and requirements.

SELECTION OF RECIPIENTS

In making award decisions, consideration is given primarily to comparative financial need; however, scholastic standing, character, and potential contribution to the College community are also factors in making certain awards.

SCHOLARSHIP AND GRANT PROGRAMS

Supplemental Educational Opportunity Grants

The College is the recipient of funds authorized under Title IV-A of the Higher Education Act of 1965, as amended. These funds enable the College to award grants to undergraduate students who have high financial need. Grants range from $200 to $1,500 per year and must be matched by other awards.

ESF Educational Opportunity Grant Program

Students accepted into the College's Educational Opportunity Program may receive, in addition to other financial assistance, a special award to pay for education-related costs. Students must come from a socio-economically disadvantaged background to be eligible.

Prospective Educational Opportunity Program students must apply for financial aid when submitting their admissions applications.

Basic Educational Opportunity Grants

The BEOG Program was authorized in the Education Amendments of 1972. Grants are available to eligible full-time and half-time undergraduate students. The amount of the award can vary from $200 to $1,800.

Applications are available from high school guidance offices or any college office of financial aid. Students should submit the Student Eligibility Report (SER) to the Office of Financial Aid as soon as it is received from the processor.

Tuition Waivers for International Students

Tuition waivers may be granted each year to qualified students from foreign countries. Interested students should contact the Assistant Vice President for Academic Programs.

Regents Programs

Additional information and applications for the following programs are available from the College or:

New York Higher Education Services Corporation
Tower Building
Empire State Plaza
Albany, New York 12255

REGENTS COLLEGE SCHOLARSHIPS

High school students who are New York State residents may qualify for a $250 annual scholarship by taking a competitive exam during their senior year.

TUITION ASSISTANCE PROGRAM

These awards are available to New York State residents who are enrolled in full-time degree programs. Based on income, awards range from $200 to full tuition. Separate application is necessary.

REGENTS GRANTS OR CHILDREN OF DECEASED OR DISABLED VETERANS

These grants are awarded to children of parents who served during specific periods of war or national emergency and who died as a result of such service, or suffered a disability of at least 50 percent. The award entitles a New York State resident to $450 per year.

Vocational Rehabilitation Grants

Financial assistance and program counseling are provided by New York State for students with disabling handicaps. Information is available from any Office of Vocational Rehabilitation.

Veterans' Benefits

The Veterans' Readjustment Benefits Act of 1966 as amended enables veterans and children of deceased or disabled veterans to obtain financial aid for their college education.

Additional information and counseling are available from the Veterans' Affairs Counselor at the College. Local veterans' administration offices, or the State Regional Office, 111 West Huron Street, Buffalo, New York 14202, can provide information and application forms.

Social Security Benefits

The 1965 amendments to the Social Security Act extended the age limit for a child's benefits from 18 to 22, providing the child is a full-time student. Local Social Security offices have additional information.

Assistance for Native American Students

Native American students with financial need may be eligible for scholarship and grant assistance through programs sponsored by the federal

Bureau of Indian Affairs and the New York State Education Department. For more information about the programs, students should contact the Bureau of Indian Affairs, 1951 Constitution Avenue NW, Washington, D.C., or the Native American Education Unit, State Education Department, Education Building Annex, Albany, New York 12234.

Private Fellowships, Scholarships, and Grants

The College administers a number of programs which have been established by private individuals, companies, organizations and foundations. These scholarships and grant programs have varying eligibility requirements and are awarded to students according to their respective guidelines which are described in more detail in *Financial Assistance at ESF*. The following is a list of the programs: Alumni Memorial Awards; Alumni Educational Grants; Nelson Courtlandt Brown Scholarship Fund; Henry H. Buckley Student Aid Award; New York State College of Forestry Foundation, Inc.; Portia Farrell Morgan Scholarship; Phyllis Roskin Memorial Award; and Student Association grants.

Syracuse Pulp and Paper Foundation, Inc. Scholarships

Scholarships from this foundation are awarded to students in paper science and engineering. The scholarship amount is $100 more than the recipient's annual tuition charge. Incoming transfer students entering the program should request a Pulp and Paper Scholarship application from the Office of Financial Aid. It is necessary to reapply each year for the scholarship.

State University Supplemental Tuition Assistance

A limited number of small grant awards are determined annually by the College for students with financial need.

EMPLOYMENT OPPORTUNITIES

College Work-Study Program (CW-SP)

The College participates in the Federal College Work-Study Program. This program provides part-time jobs during the academic year and full-time positions during the summer to students who need financial assistance to attend the College.

Other Employment

The College coordinates and maintains lists of part-time and summer employment opportunities. Interested students should contact the Coordinator of Career Services for additional information.

A part-time employment program is available to qualified veterans. More information is available from the Veterans' counselor at the College.

LOANS

National Direct Student Loans

These loans are available to students with financial need who are enrolled at least half-time. An aggregate of $6,000 is the maximum an undergraduate can borrow, and $10,000 is the aggregate a graduate student can borrow. Repayment and 3 percent interest begin nine months after leaving college. Deferment and cancellation benefits are available for certain situations.

Insured Student Loans

This program is administered by the New York Higher Education Services Corporation (NYHESC) for New York State residents. These loans are available from a bank or other lending agent to students who are registered at least half-time. Undergraduates can borrow an aggregate of $7,500 for their undergraduate studies, and a graduate student can borrow an aggregate of $15,000. Repayment and 7 percent interest begin nine months after leaving college (an additional 1 percent interest is paid at the time the loan is received). Applications are available at local banks.

Emergency Loans

The College is able to provide registered students interest-free, short-term loans. These loans are available because of the interest and support of the following donors: Alumni Association Short-term Loan Fund; C. Ives Gehring Memorial Fund; Milton Hick Memorial Fund; James D. Judson Memorial Fund; David B. Schorer Memorial Fund; and Edward Vail Emergency Fund.

Students should contact the Office of Financial Aid when need arises for a short-term loan.

GRADUATE ASSISTANTSHIPS

Assistantships are awarded to students of demonstrated scholarship and whose education and experience enable them to assist in laboratory instruction and research. The amounts of the assistantships range from $3,366 to $5,000 per year. In addition, tuition is waived. Students who hold an assistantship must be enrolled for full-time study.

Beginning graduate students may apply for assistantships on their application for admission, and continuing graduate students should consult with their major professors.

ACADEMIC REQUIREMENTS

STUDENTS AND FACULTY

Education in the classroom, laboratory and field is a cooperative endeavor between students and faculty and is an enriching experience for both.

The teaching and research faculty number about 150. Selected professors are designated as graduate faculty, but they also teach undergraduate courses and are available for undergraduate consultation.

More detailed information on academic policies is available in the *Student Handbook* which can be obtained from the Office of Student Affairs.

ACADEMIC ADVISEMENT

Upon arrival at the College, each undergraduate student is assigned to a faculty advisor, and each graduate student is assigned a major professor or advisor who can provide the student with information and advice on courses and programs both at the College and at Syracuse University. The success of this program rests largely upon the student to take the initiative in seeking assistance.

ATTENDANCE

Students are expected to adhere to the attendance policy stated by each course instructor. Instructors may make attendance part of the course requirement.

The College conforms with Section 224-2 of the state Education Law which allows students who are unable to attend classes on a particular day or days because of their religious beliefs to be excused from examinations and study or work requirements. An equivalent opportunity to make up such requirements will be made available to those absent from classes for this reason.

CREDIT HOUR LOAD

To be classified as full-time, a student must register for at least 12 credit hours during a semester. A student may not register for more than 18 credits during a semester unless permission from the student's advisor or major professor is obtained.

GRADE AND GRADE POINTS

College academic records list credit hours, grades and quality points. For each course completed, one of the following grades will be awarded:

Grade	*Definition*	*Quality Points*
A	Excellent	4.0
A-		3.7
B+		3.3
B	Good	3.0

B-		2.7
C+		2.3
C	Passing	2.0
C-		1.7
D	Minimum Passing	1.0
F	Failure	0

GRADE POINT AVERAGE

An undergraduate student must obtain a C average (2.00) to be in good academic standing. A graduate student must earn a B average (3.00) to be in good academic standing. The student's cumulative average is determined by dividing the number of credit hours carried into the total number of grade points earned for those hours.

COLLEGE HONOR LIST

Undergraduate students who have carried a minimum of 12 credit hours of coursework and who have achieved a minimum semester average of 3.0 are placed on the Dean's List for that semester.

PROBATION

An undergraduate student whose cumulative or semester grade point average falls below 2.00 or a graduate student who falls below a 3.00 will, after review by the Academic Affairs Committee, either be placed on probation or academically dismissed.

FAILURES AND INCOMPLETES

A student who fails a required course must repeat it.

A student is allowed one semester in which to make up an incomplete; failure to do so results in an F.

UNDERGRADUATE REQUIREMENTS

Students are responsible for meeting the following requirements for graduation:

A. Matriculated status as an undergraduate student.
B. All course requirements must be satisfied.
C. A minimum cumulative grade point average of 2.00 (4.00 = A) for all courses taken as a matriculated student at the College of Environmental Science and Forestry.
D. At least 24 of the last 30 credits must be registered through the College.
E. A minimum of 120 credit hours is required—a total combining credits transferred to the College and credits completed at the College—consistent with the State Education Department mandates.

COMMENCEMENT HONORS

Commencement honors are awarded to those undergraduate students who have attained one of the following academic averages: *cum laude*, 3.0; *magna cum laude*, 3.34; *summa cum laude*, 3.83.

STATEMENT OF "GOOD ACADEMIC STANDING"

The term "in good academic standing" means that a student is eligible or has been allowed to register for and undertake academic coursework at the College for the semester in question. In some instances the College may define a student as being "on academic probation." The mechanism of academic probation, including any accompanying constraints upon a student's activities, is intended merely as an educational device designed to encourage greater effort on the part of students who appear to be having difficulty in meeting certain academic standards. Placement on academic probation may *precede* denial of the right to register for academic coursework if certain conditions are not met, but a student on academic probation is considered to be in good academic standing. Any question concerning whether or not an individual student is in good academic standing will be determined by the College Academic Affairs Committee.

GRADUATE DEGREE REQUIREMENTS

Graduate programs are flexible and developed individually. Each program is planned by the major professor with the student to meet the individual's particular academic and professional needs. Sometimes this includes undergraduate courses for which no graduate credit can be given. In every case, emphasis is placed on outlining a study program leading to a high level of scholarly achievement.

An entire program for each student is planned and must be approved by the major professor, department chairman, and school dean. The program is modified as required upon recommendation of the major professor. A thesis committee composed of the major professor and two other faculty members is appointed early in each student's study program. In some departments, all graduate students are required to engage in an appropriate teaching assignment as an academic degree requirement.

THE MASTER'S DEGREE

All programs leading to the master of science (M.S.) and master of landscape architecture (M.L.A.) degrees require at least 30 semester hours of graduate credit and two semesters in residence. From 6 to 18 hours of graduate credit may be earned through completion of a thesis or special project. The remaining credit hours are earned through completion of course work (passed with an average grade of B, or better). A total of at least 15 hours of credit, including thesis and special project credits, must be in courses numbered at the 600 level or above.

Students must also pass a final oral examination defending the thesis and demonstrating knowledge of related subject areas. Acceptance of the thesis or special project requires a clear demonstration of ability to evaluate pertinent literature, to plan and execute an independent investigation, to interpret the significance of findings and to report the foregoing in a well-organized and lucid manner.

DOCTOR OF PHILOSOPHY DEGREE

In pursuing the Ph.D. degree, the student is required to work on the frontiers of knowledge in a particular field of study and to make a contribution to this knowledge. This is accomplished through original study including the search and evaluation of literature; the conception, planning, execution, and interpretation of high quality research; and the presentation of the above in a well-organized and well-written dissertation. Subsequent publication of research findings in an appropriate journal is expected.

There is no minimum credit hour requirement for the Ph.D. Each student must pass a qualifying examination before being admitted to candidacy. This two-part examination consists of a preliminary examination taken early in the period of residence to assist in planning coursework and an independent study program, and a written and oral comprehensive examination to test breadth and depth of knowledge. There is no College-wide language requirement. However, competence in a foreign language, statistics, computer programming or other "tools" may be required where they are relevant to the student's field of study. Students seeking the Ph.D. degree must be in residence for at least two semesters, and must matriculate for a minimum of three academic years. The final requirement is the presentation and defense of the thesis or dissertation.

STUDENT LIFE

HOUSING

The College of Environmental Science and Forestry does not operate its own residence facilities or food service. Students enter into a Room and Board Agreement with Syracuse University, which is adjacent to the State-operated College. Contracts for room and board made with Syracuse cover a full academic year (fall and spring semesters) and are not normally renegotiable during that time period.

Students have a choice of living centers at Syracuse University—large halls, apartment houses, cottages, fraternities and sorority houses, or cooperative units. Graduate student resident advisors live on each floor or in each unit and are available for counseling, advisement, and referral services.

Syracuse University also has housing units available for married students and their families. While veterans are given preference, nonveterans too can usually find housing.

Students who wish to live off campus may contact Alternative Action Services (ALTERACTS), a student-run housing organization at Syracuse University. An extensive listing of available housing in the Syracuse area is provided free of charge.

FOOD SERVICE

All undergraduate students living in Syracuse University housing (except those in University apartment, co-ops, and fraternities and sororities) are required to be on a University board plan. Different board plans exist to help meet varying nutritional needs of individual students. The College does not provide a food service program; however, a snack bar is available for the convenience of students. The Nifkin Lounge Snack Bar is located in the basement of Marshall Hall and is open from 8:30 a.m. to 3:30 p.m. during the academic year.

EXTRACURRICULAR ACTIVITIES

Students at the College of Environmental Science and Forestry have many extracurricular activities to choose from, both on campus and in the community.

At the College

ESF students elect class officers annually, and the *Student Association* is the official representative body governing extracurricular affairs.

Among the departmental organizations which offer students an opportunity to broaden their knowledge and to meet other students with similar interests are: *Archery Club* for those interested in field archery; a *Basketball Club*; *Bob Marshall Club*, an organization of students concerned about the future of the Adirondack Mountains; the *Forestry Club*, the traditional sponsor of the intercollegiate Woodsmen's Team; *Botany Club*; *Mollet Club*, an organization of landscape architecture students; the *Recycling Club*; the *Papyrus Club*, organized by paper science and engineering students as a way to keep up with new developments in the industry; the *Wood Products Engineering Club*, a group that sponsors guest speakers and noted lecturers; and the *Zoology Club*, which sponsors lectures, films, and field trips.

Other groups on campus include *Saengerbund*, the College singing group; and *Alpha Xi Sigma*, senior honorary society. There are also student chapters of the *Wildlife Society*, the *Society of American Foresters*, the *American Fisheries Society*, the *American Water Resources Association* and the *Forest Products Research Society*.

The two major student publications at ESF are the *Knothole*, a weekly newspaper, and *The Empire Forester*, an annual yearbook which has won many awards in past years.

Graduate student activities are the responsibility of the Graduate Student Association. A slate of officers is elected annually to coordinate academic enhancement, social, and service programs.

Recent GSA-sponsored activities include a lecture series, a College-wide urban wildlife course, a traditional fall picnic, and various social functions designed to encourage interaction between graduate students and College faculty.

At Syracuse University

Students at the College of Environmental Science and Forestry have all the privileges of Syracuse University students: participation in student government, organizations, sports, and other extracurricular activities.

Men and women at the College participate in all Syracuse University intercollegiate sports, club sports, and intramurals. Archbold Gymnasium on the Syracuse University campus is the center of athletics and physical education. Additional indoor facilities are provided through Manley Field House which is the site of Syracuse University home basketball games. Facilities at Skytop recreation area include ski tows and a ski jump, a lodge, and 22 tennis courts. The Women's Building offers instructional, social, and recreational facilities. All full-time undergraduate women are eligible to participate in intercollegiate competition in tennis, field hockey, volleyball, basketball, swimming, and diving.

Students are provided with many opportunities for acquiring musical training and performing experience through the Syracuse University Band, (Symphonic Band, Wind Ensemble, Stage Band, Concert Band and Jazz Workshops), the Syracuse University Orchestra, and the Syracuse University Chorus.

Membership is allowed in all Syracuse University student groups, including a wide variety of clubs, the International Student Association, religious and military organizations, and professional and honor societies.

In the Syracuse Area

The City of Syracuse and its surrounding countryside offer many cultural, educational, and recreational opportunities. The city has several fine museums, including the Everson with its outstanding collection of works by local, regional, and international artists; a local repertory theater; several points of historical interest; a professional symphony orchestra; and a Civic Center which attracts artists from around the world.

Eight parks lie within the city limits, numerous county and state parks, including Beaver Lake Nature Center and Montezuma Wildlife Reservation are within a short drive.

In the summer, golf enthusiasts have 23 public courses to choose from; water sports fans travel to nearby Lake Ontario, Oneida Lake, and the Finger Lakes. Winter sports, especially skiing and skating, abound in Central New York. Special annual events include the New York State Fair, the Scottish Games, and Regatta Weekend.

COLLEGE SERVICES

Academic and Personal Counseling

The Office of Student Affairs is available throughout the students' college career as a place where they may seek, at any time, the advice of experienced counselors. This office should be the first contact when questions or personal problems arise. General advisement for international students is provided by the Office of Counseling and Scheduling at ESF and by the International Student Office at Syracuse University. The Director of Counseling and Scheduling is available as needed to provide information and guidance on general academic and specific program requirements. The College Registrar maintains the student's record of academic achievement during enrollment at the College and handles the registration process. In addition, the Director of Financial Aid provides information on available scholarships, long-term state and federal educational loans, work opportunities at the college, and assistance with major financial problems.

Traditionally, the College faculty has placed emphasis on academic advisement, both formally and informally, to meet individual student needs and considers this close faculty-student association to be a major academic strength. During registration, the undergraduate student is assigned to a faculty advisor for assistance, as needed, in curriculum decisions, program development, and elective decisions. In curriculum selection, special advisors are assigned to provide academic advice as needed. Faculty in the major departments are also available for academic guidance. In addition, many classes are small, permitting students ample opportunity to discuss their courses and professional aspirations with instructors. While advice and counsel are available on an individual basis, students at the College are encouraged early in their careers to become independent and responsible for their academic decisions.

Career Services

Selecting an appropriate career and securing meaningful employment are ongoing processes subject to many variables, and based on an individual's experience and abilities. Helping a student sort through options, become aware of opportunities, and develop skills necessary to gain one's desired occupation are the concerns of the Career Services Office.

The objective of this office is to provide a variety of opportunities through resource materials, programs, and job development and counseling, to meet the individual needs of each student at his/her various stages of career readiness. Some services offered by the Career Services Office are workshops; seminars; lists of full-time, part-time, and summer jobs; recruiting programs; advanced study information; counseling; newsletters; reference materials; an out-reach program in the Library; and an alumni job list.

Each year this office conducts a placement survey to monitor the success and progress of our college graduates. The reports are shared with the college community and made available to the public upon request. The following are statistics for the classes of 1977 and 1978:

Of the 492 graduates from the *Class of 1977*:

(40.4%)	199	were employed in their major field of study
(9.1%)	45	were employed out of their major field of study
(25.2%)	124	were entered in an advanced study program
(13%)	64	were still available for employment
(12.1%)	60	were unavailable for employment or did not respond

Of the 565 graduates from the *Class of 1978*:

(48%)	271	were employed in their major field of study
(12.5%)	71	were employed out of their major field of study
(19.1%)	108	were entered in an advanced study program
(4.6%)	29	were still available for employment
(15.5%)	88	were unavailable for employment or did not respond

Veterans' Counseling

Veterans can receive personal counseling on social, financial, or academic problems through the Office of Student Affairs. Information and application forms for V.A. Educational Benefits, Tutorial Assistance, Work-Study Allowance and the ESF Veterans' Tuition Deferral Plan are available upon request. A Veterans Administration representative is available periodically for information pertaining to veterans' welfare and benefits while on campus.

Other Counseling

Full-time ministries are provided in all the major religious groups. They center their programs at Hendricks Chapel except for Roman Catholics, who are served at St. Thomas More Chapel. The dean of Hendricks Chapel coordinates religious activities, working with several full-time and part-time denominational chaplains and advisors. The program of St. Thomas More Chapel is under the direction of a chaplain.

Faculty act as advisors to extracurricular clubs and organizations at the College. The Office of Student Affairs also provides assistance and counseling in the area of student activities.

Resident advisors are located in all University dormitories and are available for assistance if needed.

As students reach the end of their undergraduate years, they often seek career guidance. Highly motivated students should consider the question of whether or not to continue their education in graduate school. At the College, this sort of counseling is handled by the departments or divisions in which the major work is taken and the Office of Career Services.

Health and Medical Facilities

Students may consult a physician for medical care or health advice at the Syracuse University Student Health Service. Full-time students are entitled to unlimited visits to the out-patient clinic and also 10 days of confinement per college year with ordinary medical care in the infirmary. Infirmary usage over 10 days will be at prevailing infirmary rates. Some laboratory examinations, if necessary for treatment or diagnosis of common illness, are provided without cost. Most common legal drugs are provided at a minimal charge.

A student accident or sickness insurance plan, available at fall registration, not only supplements the usual infirmary privileges, but is also a health protection plan during the summer months when students are not under the care of the Health Service. Married students with dependents who are not covered by Health Service privileges are strongly urged to provide themselves and their families with special insurance made available to University students. *All international students are required to carry health and accident insurance.*

DEGREE PROGRAMS AND AREAS OF STUDY

The College awards degrees in the following programs:

School of Biology, Chemistry and Ecology

Chemistry; B.S., M.S., Ph.D., with areas of study in biochemistry, natural products chemistry, environmental chemistry, or natural and synthetic polymer chemistry.

Environmental and Forest Biology; B.S., M.S., Ph.D., with areas of study in ecology, entomology, environmental physiology, fish and wildlife biology and management, pathology and mycology, pest management, plant science, soil ecology, or zoology.

Interdepartmental area of study in chemical ecology; M.S., Ph.D.

School of Forestry

Resource Management; B.S., with areas of study in forest resource science, management science, or applied resource management.

Resource Management and Policy; M.S., Ph.D., with areas of study in forest management, recreation management, policy and administration, forestry economics, quantitative methods, or land use planning.

Silviculture and Forest Influences; M.S., Ph.D., with areas of study in silvics, silviculture, forest soil science, tree improvement, or forest influences.

Interprogram areas of study in urban forestry or international forestry; B.S., M.S., Ph.D.

School of Forest Technology

Forest Technology; A.A.S.

School of Environmental and Resource Engineering

Forest Engineering; B.S.

Paper Science and Engineering; B.S.

Wood Products Engineering; B.S., with options in building construction, or forest products in which emphasis may be chosen in marketing, production systems engineering, or wood science.

Environmental and Resource Engineering: M.S., Ph.D., with areas of study in forest engineering, paper science and engineering, or wood products engineering.

School of Landscape Architecture

Environmental Studies, B.S.

Landscape Architecture; B.L.A.

Landscape Architecture; M.L.A., with areas of study in social/behavioral studies, natural/physical applied sciences, or design process, methods and management.

College-Wide Program

Graduate Program in Environmental Science; M.S., Ph.D., with areas of study in environmental education/communication, environmental assessment and impact analysis, environmental land use planning, water resources, or environmental science.

THE SCHOOL OF BIOLOGY, CHEMISTRY AND ECOLOGY

STUART W. TANENBAUM, *Dean*

The School of Biology, Chemistry and Ecology offers two curricula which support environmental science and forestry through the Department of Environmental and Forest Biology and the Department of Chemistry.

ENVIRONMENTAL AND FOREST BIOLOGY

JOHN B. SIMEONE, *Chairman*

The Department of Environmental and Forest Biology provides students with a firm foundation in basic biology in association with the principles of forest ecosystems and environmental science. It encompasses a variety of interconnected disciplines which concern themselves with living systems. It treats not only the form, function, and evolution of organisms, but their life requirements, tolerances, and interactions that are central to the stewardship of renewable natural resources and the maintenance of an environment of acceptable quality.

Effective management and protection of forests and related natural resources is increasingly dependent upon the understanding of living systems relative to productivity and tolerance to environmental impacts caused by the activities of man. Therefore, basic knowledge of biology is prerequisite to desirable practices and sound regulations for optimizing both the development and use of natural resources while avoiding deleterious impacts.

The critical importance modern society places upon the utilization of natural resources and the quality of our environment adds new and increasingly diverse dimensions to the services a well-trained biologist can render. The department is committed to meet this dynamically changing array of opportunity through diverse courses enriched by an active program of research that focuses upon upper-level undergraduate and graduate study. Through the addition of selected electives to a required core, undergraduates may focus their program toward a special biological field (see p. 51) or toward future graduate study. Graduate students may develop a course of study under the guidance of a major professor and graduate committee within any of several study concentrations (see p. 54).

In general, these academic programs attempt not only to stimulate interest in the recognition and understanding of traditional organismal taxa such as plants, animals, and protists, but deals as well with understanding the dynamic changes in biological systems which can be best ascertained in the context of the broad fields of ecology, physiology, evolution, and genetics. This understanding is accomplished by an integration of coursework with a strong research program, much of which is concerned with natural resource management and improvement of the quality of man's environment.

Undergraduate Program

The curriculum for the Bachelor of Science degree is built around a core of required courses which provide the student with a general education, an orientation to forestry, and a basic background in the principles of the biological and the physical sciences. Its design develops breadth in biology as well as depth in a selected biological field. Thus, although individual course selections around the required core may vary, all students major in biology and each, with an assigned advisor, develops a special plan of study.

A total of 125 credit hours, 60 of them required prior to matriculation, is required for the Bachelor of Science degree. In addition to the core courses specified below, at least 21 hours in biology must be completed. These courses should be compatible with the intended concentration of study and must be at the 300 level or above. Six of the 21 credit hours must involve subject matter in Plant Science (courses designated FBO) and six in Animal Science (courses designated FEN, FZO), both exclusive of the five-hour summer field requirement. The balance of the required hours are chosen in consultation with the advisor.

Lower Division Courses

Since training in residence begins normally at the junior level, the curriculum facilitates transfer of freshman and sophomore credits from other institutions. It is recommended that students seeking entry should have successfully completed a minimum of 60 credits which include:

Course Area	*Credit Hours*
*General Chemistry with Laboratory	8
Organic Chemistry with Laboratory	8
* General Physics with Laboratory	8
Mathematics, through Integral Calculus	6-9
English	6
Social Sciences—Humanities*	9-12
*General Botany and Zoology **OR** General Biology with Laboratory	8
Biology Electives	3-6
TOTAL MINIMUM LOWER DIVISION CREDITS	60

*To enter at the junior level, it is strongly recommended a student have completed these courses prior to registration.

**A course in technical writing and/or speech is recommended as part of the Social Science—Humanities group.

Upper Division Courses

Junior Year

			Credit Hours
First Semester	FBO 315	Dendrology	3
	FBL 320	General Ecology	3
	FEN 350	Elements of Forest Entomology	3
	Electives		6
			15
Second Semester	APM 491	Introduction to Probability and Statistics	3
	ERM 345	Soils **OR** GOL 105 Earth Science	3
	FBL 330	Principles of General Physiology	3
	Electives		6
			15

Summer Field Experience—Must be met as described on page 50 5

Senior Year

			Credit Hours
First Semester	Electives		15
Second Semester	FBL 470	Principles of Genetics	3
	FBL 471	Genetics Laboratory	1
	Electives		11
			15
		TOTAL MINIMUM UPPER DIVISION CREDITS	65

A total of 125 credit hours is required to complete the B.S. degree in environmental and forest biology.

SUMMER FIELD EXPERIENCE

The curriculum requires that between the junior and senior year each student completes a minimum of five semester credit hours or its equivalent during five weeks' residence in an approved academic program in field biology. This requirement can be met by the appropriate selection of courses in Environmental Biology at the Cranberry Lake Biological Station (CLBS) where six to eight courses are offered during each of two five-week sessions (see p. 52). Earning five credits at one session satisfies the requirement; any additional courses taken in the other session count as elective credits.

One of the following alternatives to the CLBS program may instead be selected to fulfill the summer field requirement:

Alternative 1

Students desiring an experience in the principles and practices of professional forestry should attend the five-week Summer Session in Field Forestry at the Pack Forest, Warrensburg Campus. Field instruction at this Campus emphasizes subject matter in dendrology, forest ecology, surveying, mensuration, and cartography.

Alternative 2

Other Biological field stations may be attended to earn the minimum five semester hours credit or its equivalent during a five-weeks' term of junior-senior level coursework. Petitions requesting this alternative must have appended course descriptions and program contemplated and be submitted no later than one month prior to the end of the spring semester preceding the summer program. A current file of alternative stations and course descriptions is maintained by the Curriculum Director.

Alternative 3

FBL 420, Field Experience-internship, under professional supervision may be authorized when containing a major academic-learning component and when thoroughly planned and well documented. It must be related to and supportive of the indicated career goal. The student must receive advance agreement from a member within the Department of Environmental and Forest Biology faculty to guide, collaborate, evaluate a work plan for the summer, and later assign a grade and credits to the internship. The plan must be submitted at least one month prior to the end of the spring semester and must be approved by the Curriculum Director.

Electives

General requirements for graduate study and a wide range of federal, state, municipal, and private biology positions are met by the curriculum. Through skillful selection of electives, the student may prepare for special biological fields related to natural resources or the environment. Those

training for biological positions in federal and state service should review Civil Service publications and become familiar with specific course requirements early enough to make timely elective choices. Students planning to meet special requirements for Federal Civil Service positions in forestry may do so by electing 10 credits in forestry courses and attending the Summer Session in Field Forestry at the Warrensburg Campus. Students are urged to use some elective time to enhance their communications skills. Courses in technical writing, applied communications or a language (as approved by their faculty advisor) are useful.

Special Biological Fields

Plant Science. Students may prepare for a wide variety of opportunities in the botanically oriented professions. Essential to understanding plants are their biochemical and physiological processes; their interactions with the environment and with one another; with animals and other organisms; their genetic makeup, evolution and classification. Requirements may be satisfied for such professional areas as botany, plant ecology, tree genetics, plant physiology, horticulture, tree maintenance, or plant quarantine.

Forest Pathology and Mycology. Protection of vascular plants and wood products from invading organisms, such as fungi, is basic to forest productivity, effective wood product use, and the maintenance of environmental quality. Program strength is in the ecological, physiological, genetic, and environmental aspects of disease. Students may train for positions in forest pathology, mycology, pest management, plant quarantine, or diagnostic laboratories. Opportunities for employment exist with federal, state, and private agencies.

Entomology. Insects play significant roles, both beneficial and detrimental, in their interactions with man, his resources, and his environment. Several courses are available on insect life and functions that enable a student to fulfill requirements of Civil Service and a variety of other employers. Program strengths are in forest entomology, medical entomology, pest management, and environmental toxicology.

Fish and Wildlife Biology and Management. A basic and applied program in fish and wildlife biology, including management and behavior, is provided for the student whose objectives are to develop professional skills in the biology and management of these natural resources.

Zoology. A basic and broad program is provided for the student whose objectives are to go on for graduate study or to further training in such subjects as physiology, soil invertebrate ecology, animal behavior, or animal ecology. Some opportunities with federal and state agencies are available at the baccalaureate level.

Ecology. Students are offered the opportunity to develop ecological skills in a number of areas. However, one's career potential is enhanced when ecological study is combined with knowledge of a major taxonomic group such as higher plants, microbes, or animals, including vertebrates or invertebrate forms such as insects, or with another unifying science such as physiology, biochemistry, genetics, or environmental chemistry.

Pest Management. Modern control of insects and disease dictates practices appropriate to maintaining an acceptable environmental quality. Through proper selection of courses, a student is able to achieve training that will result in wise selections of methods for an integrated approach to pest management. Training is more than adequate to prepare students for state examinations required for pesticide applicator's certification.

Silvics. Manipulation of forest ecosystems for human benefit relies upon strong preparation in biology. Students may combine plant sciences, silviculture, pathology, entomology and other courses to lead either to graduate study in silviculture or to forestry positions in industry or in municipal, state, or federal government.

Program in Environmental Biology

Cranberry Lake Biological Station
Cranberry Lake Campus
Cranberry Lake, New York

Students in the Environmental and Forest Biology curriculum generally satisfy their summer requirement by attending either session of the Summer Program in Environmental Biology at the Cranberry Lake Biological Station. Courses at the Station are senior-level offerings designed to come after the junior year spent on the Syracuse Campus. Students elect three courses during the five-week period and earn five semester-hours credit; any extra credits earned by attending both sessions count toward elective hours in biology. Students from other institutions are welcome, provided space is available.

Cranberry Lake and its environs are ideally suited for an advanced biology summer program. The surrounding topography is rolling hill and lake country dotted with numerous small ponds, closed bogs, and stream drainages. The lake itself is the third largest body of water in the Adirondacks. Because 80 percent of the shoreline is in State ownership, the lake remains relatively unspoiled by recreational developments and is free of pollution problems. Much of the original forest cover in the region was harvested years ago; today a rich variety of community types occupy those sites as the vegetation reverts again to the natural forest condition. The remaining virgin forests also provide the student with many examples of

stable forests, each type reflecting the particular environmental conditions controlling forest development. A wealth of wildlife parallels the variety of cover types over the region. The area is centrally located, providing easy access to a wide range of additional ecosystems ranging from bog to alpine types.

Facilities include four classroom-laboratories; dining facilities capable of serving 120; faculty quarters and cabins; an administration building; 12 cabins housing 6-8 students each; a recreation hall; and several smaller, supporting buildings.

The 10-week program extends from mid-June into mid-August and is divided into two five-week sessions. Courses are taught in blocks of 2½-day units, permitting concentrated study without hourly interruptions. These courses are designed to emphasize and effectively utilize the unique nature of this Adirondack setting, and all involve field trips each day into the surrounding forest and aquatic ecosystems. The scheduling of these courses* remains fairly constant from year to year.

SESSION I. FBO 417 Adirondack Flora, FBO 427 Bryoecology, FZO 424 Vertebrate Ecology, FZO 427 Field Ornithology, FEN 450 Forest and Aquatic Insects, FBL 421 Ecology of Freshwaters, FBO 460 Field Problems in Forest Pathology, FBL 400 Forest Techniques for Biologists, FBL 498 Independent Research.

SESSION II. FBO 428 Wetland Plant Ecology, FBO 465 Field Mycology, FZO 424 Vertebrate Ecology, FZO 475 Animal Behavior, FZO 423 Microcommunity Ecology, FEN 460 Insect Ecology and Behavior, FOR 441 Forest Influences, FBL 400 Forest Techniques for Biologists, FBL 498 Independent Research.

Room, board, and fee charges are approximately $60.00 per week. Students wishing more information about the Summer Program in Environmental Biology may obtain a copy of the *Station Handbook* from the Director, Cranberry Lake Biological Station, State University of New York College of Environmental Science and Forestry, Syracuse, New York 13210.

---

*See pages 124, 125, 127, 130, 131, 133, 134, 155, of this catalog for further descriptions of these courses.

Graduate Program

The graduate program in Environmental and Forest Biology is organized in nine interdependent biological study concentrations that provide comprehensive coverage within specific interest areas. Each concentration is governed by indicated faculty who define the scope of subject matter, recommend acceptance of students and guide them in a course of study. Some of these concentrations follow taxonomic lines while others are broad unifying areas basic to all taxa; one includes faculty of both Chemistry and Environmental and Forest Biology Departments. Students choosing to emphasize a taxonomic category should explore the desirability of engaging to some extent in the broader interdisciplinary areas. Similarly, it is often considered opportune for students enrolled in the latter to develop a degree of specialization in at least one taxon as a means of assuring a useful mix of talents. Those students whose interests are not served by the designated areas of concentration should explore the feasibility of alternate routes of study, provided the needed expertise is available, and they may be guided by faculty listed in the concentration nearest the student's interest.

The major center of activity is Illick Hall, with the laboratories, classrooms, controlled spaces, and equipment that one would expect in a modern, five and one-half-storied building in which 85,000 square feet of working space is available for graduate study and research. Laboratories, many of them temperature and temperature-humidity controlled, and one sound-controlled, are provided for diverse study: plant development, physiology, tissue culture, biochemistry and toxicology, ecology, animal behavior, and similar endeavors. An herbarium, mycological collections, insect and other arthropod collections, and the Roosevelt Wildlife Collection of vertebrates are maintained in archival condition as useful resources for the academic program. Eight rooftop glasshouse units, three of them air-conditioned and one incorporated into a five-room indoor-outdoor insectary, are important to the full array of interests in plant science and plant-animal interactions.

Also available to the Department's students and faculty is a variety of sophisticated instrumentation: convenient access to a computer center; radio-isotope counting equipment, including liquid scintillation spectrometer and Cobalt-60 source; diverse analytical equipment and measuring devices; gas-liquid chromatography; and, in collaboration with the Chemistry Department, a comprehensive analytical expertise. The Nelson C. Brown Center for Ultrastructure offers scanning and transmission electron microscopy capability.

Supportive to the program are the academic resources, including courses, of Syracuse University, SUNY's Upstate Medical Center and the several campus facilities described elsewhere in this catalog. Our students participate as well in courses and utilize faculty and facilities at Cornell University in cooperative exchanges.

Excellent field sites and facilities are available for research in all aspects of the program in nearby or moderately distant locations from the Syracuse campus. In addition to the College's several campuses and field stations that offer a broad diversity of forest types, sites, and conditions, there are New York State Department of Environmental Conservation lands, the Montezuma National Wildlife Refuge, the Adirondack Mountains, and the transition zones near Lake Ontario, Oneida Lake, and Cicero Swamp that collectively offer a variety of habitat diversity from highlands to aquatic-terrestrial zones. The ponds, streams, and lakes in Central New York and the St. Lawrence River are regularly used by graduate students in wetlands and aquatic ecology and fishery biology.

Further academic advantages stem from the urban setting of the Syracuse campus. The Greater Syracuse area provides a convenient laboratory for studies basic to urban forestry: the growth and protection of woody vegetation, greenspace maintenance, the utilization of waste beds for plant growth, the detoxification of pollutants, and the restoration of terrain stripped of vegetation. Disposal of industrial and human pollutants and wastes require deeper understanding of the role of plants, animals and microorganisms in the biodegradation of organic matter. The conversion of organic materials into useful fuel, into additives for plant growth, or into protein feeds for domestic animals, to name a few, are stimulating study-in-depth of many elements of basic biology while at the same time offering substantial assistance toward the solution of pressing human problems.

Of the nine available study concentrations, eight are contained within the department: *Ecology, Entomology, Environmental Physiology, Fish and Wildlife Biology and Management, Pathology and Mycology, Plant Science, Soil Ecology*, and *Zoology*. One concentration is shared with faculty of the Chemistry Department: *Chemical Ecology*.

Ecology

ALEXANDER (Vertebrates, Wetlands), ALLEN (Forest Insects), BEHREND (Wildlife), BROCKE (Wildlife, Bioenergetics), CHAMBERS (Wildlife), DINDAL (Invertebrates), GEIS (Plants, Wetlands), KETCHLEDGE (Dendrology, Bryology), KURCZEWSKI (Insect Behavior), MITCHELL (Invertebrates, Bioenergetics), MORRIS (Diptera), MULLER-SCHWARZE (Vertebrates, Behavior), PORTER (Vertebrate Ecology), RAYNAL (Higher Plants, Taxonomy), RINGLER (Fishery Biology), SCHAEDLE (Plant Nutrition), SHIELDS (Vertebrate Behavior), SIMEONE (Forest and Wood-boring Insects), TIERSON (Wildlife), VAN DRUFF (Wildlife), WERNER (Limnology).

Understanding relationships between living organisms and their abiotic and biotic environment is fundamental to environmental science which also encompasses man's role in ecological systems. Ecology is an integrative science which depends on an understanding of ecological theory, habitat characteristics, and the basic biological attributes of organisms. This concentration area encourages the incorporation of this knowledge into those areas of practical concern. Specific research may entail the study of: distribution and abundance of organisms; community structure including trophic relationships, diversity or succession; and ecosystem properties such as patterns of energy transfer and biogeochemical cycling.

Entomology

ABRAHAMSON (Forest Insects, Pest Management), ALLEN (Forest Insects, Population Ecology), BREZNER (Physiology), KURCZEWSKI (Morphology, Taxonomy, Behavior), LANIER (Forest Insects, Pheromones, Cytotaxonomy), MILLER (Pest Management), NAKATSUGAWA (Toxicology), NORTON (Spiders and Mites, Insect Larval Taxonomy), SIMEONE (Forest and Wood-inhabiting Insects).

Adjunct Faculty

HOWARD (Medical Entomology), JAMNBACK (Diptera Ecology and Control), MORRIS (Medical Entomology), NAPPI (Physiology, Pathology).

Graduate study opportunities are most often found in the basic aspects of insect life and the role of insects in relation to man and his environment. The wide range of effects stemming from insect activity, from the beneficial to the deleterious, allows for a variety of research subjects in which insects play a major role. Thesis topics may concern insects affecting forests, shade trees and wood products, those relating to the health and well-being of man and those playing key roles as biotic parasites and predators of pest

species. Current research areas include population dynamics of forest defoliators, pheromone communications among beetles and moths, speciation of insects as understood through behavioral and cytogenetic study, biological control of insects of forest and public health importance and basic biochemistry of insect detoxification mechanisms.

Environmental Physiology

BREZNER (Insect Physiology), CASTELLO (Plant Virology), GRIFFIN (Fungus Physiology), HARTENSTEIN (Invertebrate Physiology), MITCHELL (Environmental Energetics), NAKAS (Microbial Physiology), NAKATSUGAWA (Insect and Vertebrate Toxicology), SCHAEDLE (Plant Physiology), WALTON (Plant Physiology), WILCOX (Plant Physiology).

Graduate study may include courses according to chosen academic goals, and research may include functional and molecular areas. Of current interest are mechanisms of action of plant growth hormones; biochemical regulation of seed germination; plant and microbial enzymology and virology; toxic action and detoxification of insecticides by vertebrate and invertebrate animals; production and action of plant phytoalexins and antibiotics; plant defenses against phytophagous invertebrates; mycorrhizae, ion transport, mineral nutrition, cambial physiology, and photosynthesis.

Fish and Wildlife Biology and Management

ALEXANDER (Vertebrates, Herpetology), BEHREND (Vertebrates), BROCKE (Vertebrates), CHAMBERS (Vertebrates), PAYNE (Ornithology), PORTER (Vertebrate Ecology), RINGLER (Fisheries Biology), TIERSON (Vertebrates), VAN DRUFF (Vertebrates, Ornithology), WERNER (Limnology).

Study in this area provides students with advanced preparation at both the M.S. and Ph.D. levels in biological concepts of fish and wildlife populations, particularly as they relate to the proper management of these important resources. Widespread and increasing concern for management of these wild animal resources has been matched by strong student interest in educational programs which prepare them for careers in the fish and wildlife professions. Graduate education, such as is available through this study area, is rapidly becoming a universal prerequisite to employment as a professional fisheries or wildlife biologist.

Areas of research include wetland ecology and management of wetland species, population-habitat relationships, predator ecology, urban wildlife relationships, endangered species studies, feeding ecology of fishes, stream ecology, ecology of larval fishes and homing behavior of fishes.

Forest Pathology and Mycology

CASTELLO (Forest Pathology), GRIFFIN (Fungus Physiology), MANION (Forest Pathology), WANG (Mycology), WILCOX (Mycorrhizae), ZABEL (Forest Pathology and Wood Deterioration).

The study area in Forest Pathology and Mycology seeks to train students interested in developing an expertise responsive to the increasing pressures on forest and shade tree systems for wood fiber, public services, and amenities. This requires new sophisticated levels of disease understanding, disease control, a broad knowledge of fungi, bacteria and viruses, their environmental impacts and their roles in biodeterioration. Areas of staff interest and expertise appropriate for graduate student research emphasis include: environmental, fungal and viral tree diseases; mycorrhizae; wood decay and biodegradation processes; monitoring and impact assessment of disease in forest and urban tree systems; chemical and biological control of tree diseases; epidemiology of tree diseases and the genetics of resistance to tree diseases and to pathogen variability; physiology of fungus growth and development; taxonomy and biology of decay and imperfect fungi; fungus ultrastructure.

Plant Science

CASTELLO (Virology), GEIS (Ecology), GRIFFIN (Mycology, Fungus Physiology), KETCHLEDGE (Ecology, Bryology), MANION (Pathology), RAYNAL (Ecology, Taxonomy), SCHAEDLE (Physiology), TEPPER (Anatomy, Morphogenesis), VALENTINE (Genetics), WALTON (Physiology), WANG (Mycology), WILCOX (Physiology, Mycorrhizae), ZABEL (Pathology, Wood Deterioration).

Adjunct Faculty

AMES (Physiology), ELIAS (Ecology), FAUST (Taxonomy), KARNOWSKY (Genetics), SETLIFF (Mycology).

Plants, as the principal energy source for ecological food chains, serve as the structural and functional foundation of natural and managed ecosystems. The plant science concentration provides opportunity for study in a broad range of specialties fundamental to the understanding of plants and their interaction with other organisms, emphasizing both forest and related plant systems. Current faculty and student research interests include: dynamics of plant communities as affected by man and the environment; mechanisms of plant succession; epidemiology of forest and urban tree diseases; decay, discoloration and biomodification of wood; taxonomy, physiology, growth and ultrastructure of fungi; heritability of wood properties and disease resistance of trees; biochemistry and physiology of plant growth regulators; photosynthesis; mineral nutrition; mycorrhizae; bryoecology; morphogenesis in shoot and root systems; and plant tissue culture.

Soil Ecology

DINDAL (Invertebrates), HARTENSTEIN (Invertebrates, Physiology), MITCHELL (Invertebrates, Energetics), NAKAS (Microbiology), NORTON (Invertebrates, Taxonomy), GRIFFIN (Fungus Physiology), WANG (Mycology), WILCOX (Mycorrhizae), ZABEL (Wood Biodegradation).

Soil ecology includes the study of interrelationships of soil-inhabiting organisms (as individuals, populations and communities) with their biotic, chemical, and physical environments. This field can be considered to be a frontier of science because of the myriad of undescribed species of soil-dwelling arthropods, nematodes and annelids, and the wealth of incompletely understood symbiotic relationships that can be readily discovered by students in this concentration. Soil ecology deals with fundamental aspects of biodegradation and nutrient cycling and is therefore important for improvements in crop culture and enlightened waste disposal.

The soil ecology concentration is supported by courses in physical aspects of soils, plant and animal taxonomy and general ecology.

Zoology

ALEXANDER (Vertebrates, Wetlands), CHAMBERS (Wildlife Ecology, Management), DINDAL (Invertebrates), HARTENSTEIN (Physiology, Invertebrates), MITCHELL (Invertebrates, Bioenergetics), MULLER-SCHWARZE (Vertebrate Behavior), NORTON (Arachnology), RINGLER (Fishery Biology), SHIELDS (Vertebrate Behavior), VAN DRUFF (Wildlife Ecology), WERNER (Limnology, Aquatic Ecology).

Adjunct Faculty

BROWN (Wildlife).

Zoology provides opportunity for in-depth coursework and fundamental research in morphology, physiology, taxonomy, and behavior of invertebrate and vertebrate animals. As one of the basic areas in the Department of Environmental and Forest Biology, Zoology is supportive of other concentrations such as Ecology, Fish and Wildlife Biology and Management, and Soil Ecology. Graduate studies in Zoology include both basic and applied research on animals of our natural ecosystem, including their associated soils and waters.

CHEMISTRY

KENNETH J. SMITH, *Chairman*—(Physical and Polymer Chemistry), CALUWE (Organic Polymer Chemistry, CAMPBELL (Phytoenzymology), FLASHNER (Biochemistry), JOHNSON (Environmental Chemistry), LALONDE (Organic and Natural Products Chemistry), LEVIN (Physical and Polymer Chemistry), MEYER (Nuclear Chemistry), SARKO (Physical and Polymer Chemistry), SCHUERCH (Wood and Polymer Chemistry), SILVERSTEIN (Ecological Chemistry), SMID (Physical and Polymer Chemistry), SZWARC (Physical and Polymer Chemistry), TIMELL (Wood Chemistry).

The academic program assists the student not only to develop an understanding of chemical phenomena, but also an appreciation for chemistry which can link it to the biological and applied sciences. Thus, programs include courses in the traditional areas of chemistry but require study in additional fields on which chemistry has and will continue to have an impact. Emphasis on the investigative function of chemical science is manifest in the research offerings at the undergraduate as well as graduate levels of study.

The Department of Chemistry offers the following areas of concentration leading to the Bachelor of Science degree:

Biochemistry and Natural Products Chemistry

Environmental Chemistry

Natural and Synthetic Polymer Chemistry

Students in all options, by selecting proper electives, may be certified on graduation as having completed an American Chemical Society approved curriculum. All options are excellent grounding for professional work at the B.S. level or for advanced graduate study.

Undergraduate Program

Lower Division Courses

For students transferring into the College as juniors, recommended courses consist of 68 credits or an associate degree and include:

Course Area	*Credit Hours*
Biology with Laboratory	8
General Chemistry with Laboratory	8
Organic Chemistry with Laboratory	8
Physics with Laboratory	8
Economics	3
English	6
Language, Literature or Communication	6
Electives	12-15
*Mathematics	6-9
TOTAL MINIMUM LOWER DIVISION CREDITS	68

*Mathematics through integral calculus. An additional mathematics course beyond integral calculus is required for the B.S. degree.

Upper Division Courses

Junior Year

			Credit Hours
First Semester	FCH 325	Organic Chemistry III	4
	CHE 332	Quantitative Analysis	2
	CHE 333	Quantitative Analysis Lab	1
	CHE 346	Physical Chemistry	3
	[1]Professional Elective		2-4
	Elective		3
			15-17
Second Semester	[2]Math or Elective		3
	FCH 380	Instrumental Methods	3
	CHE 356	Physical Chemistry	3
	CHE 357	Physical Chemistry Lab	1
	FCH 384	Spectrometric Identification of Organic Compounds	1
	[1]Professional Elective		2-3
	Elective		3
			16-17

[1]A sequence of professional electives should be chosen in the junior year. In addition to the freshman biology courses, a student whose emphasis is in biochemistry must take 3 semester hours of genetics and at least one other 3-semester-hour biology course. A student whose emphasis is in natural products must take 3 semester hours of biology in addition to the freshman biology courses and an additional hour of organic chemistry laboratory (FCH 496) and a second hour of FCH 384.

[2]One course of mathematics or applied mathematics beyond MAT 397, or equivalent, is required.

Biochemistry and Natural Products Chemistry Option

This option is designed for students who wish to approach problems in the life sciences with the tools and point of view of the chemist. In addition to a major concentration in the several branches of chemistry, the student obtains a solid grounding in the fundamentals of physics, mathematics, and biology. Professional electives can provide a minor concentration in botany, ecology, entomology, zoology, or physiology. Collaborative efforts of chemists and biologists are providing new solutions to problems of environment, natural resources, and health.

Senior Year

First Semester	LIB 300	Library Research	1
	FCH 495	Introduction to Professional Chemistry	1
	FCH 475	Wood Chemistry I	2
	FCH 478	Wood Chemistry Lab	1
	FCH 530	Biochemistry I	3
	FCH 531	Biochemistry Lab	2
	[1]Elective		3
	Elective		3
			16

Second Semester	[2]FCH 498	Introduction to Research	5
	FCH 497	Undergraduate Seminar	1
	FCH 532	Biochemistry II	3
	FCH 477	Wood Chemistry III	2
	Elective		3
	Elective		3
			17
		TOTAL MINIMUM UPPER DIVISION CREDITS	64

[1]Introduction to Polymer Science, FCH 450 (3 credit hours) is suggested.
[2]Petition by student to Department for replacement of this requirement will be considered to allow time for special interest.

A total of 132 credit hours is required to complete the B.S. degree in chemistry with the biochemistry and natural products option.

Environmental Chemistry Option

The environmental chemistry option is designed for those students who wish to obtain a solid fundamental background in chemistry which will enable them to make a strong contribution towards the identification and solution of problems in the areas of pollution, air and water quality, analysis and basic research in environmental chemistry. A large number of professional electives, available through course offerings of other departments such as biology and engineering, provide the important interface with other disciplines necessary for a working understanding of the complex problems inherent in environmental studies.

Senior Year			*Credit Hours*
First Semester	LIB 300	Library Research	1
	FCH 495	Introduction to Professional Chemistry	1
	FCH 475	Wood Chemistry I	2
	FCH 478	Wood Chemistry Lab	1
	FCH 510	Aquatic Environmental Chemistry	3
	[1]Professional Elective		2-3
	[2]Elective		3
	Elective		3
			16-17

Second Semester	[3]FCH 498	Introduction to Research	5
	FCH 410	Chemistry of Pollution	1-3
	FCH 497	Undergraduate Seminar	1
	FCH 477	Wood Chemistry III	2
	Electives		6
			15-17

TOTAL MINIMUM UPPER DIVISION CREDITS 63

[1]A wide variety of courses offered by the departments of chemistry, environmental and forest biology, forest engineering and resource management is available to supplement the environmental chemistry concentration.
[2]Biochemistry I, FCH 530, (3 credit hours) is suggested.
[3]Petition by student to Department for replacement of this requirement will be considered to allow time for special interest.

A total of 131 credit hours is required to complete the B. S. degree in chemistry with the environmental chemistry option.

Natural and Synthetic Polymer Chemistry Option

This option is designed for students interested in the structure and physical properties of man-made and natural materials, the giant molecules of wood, plastics, polysaccharides, proteins, rubbers, and fibers. The re-chemistry of these materials constitutes one-half the concern of the chemical industry and is the origin of a major revolution in our way of life and our understanding of nature. This special subject area is an advanced core of studies beyond the basic courses of the classical undergraduate chemistry curriculum.

Senior Year *Credit Hours*

First Semester	LIB 300	Library Research	1
	FCH 495	Introduction to Professional Chemistry	1
	FCH 450	Introduction to Polymer Science	3
	FCH 551	Polymer Techniques	2
	FCH 475	Wood Chemistry I	2
	FCH 478	Wood Chemistry Lab	1
	[1]Elective		3
	Elective		3
			16

			Credit Hours
Second Semester	[2]FCH 498	Introduction to Research	5
	FCH 552	Polymer Processing and Technology	3
	FCH 497	Undergraduate Seminar	1
	FCH 477	Wood Chemistry III	2
	Electives		6
			17
		TOTAL MINIMUM UPPER DIVISION CREDITS	64

[1]Biochemistry I, FCH 530 (3 credit hours) is suggested.
[2]Petition by the student to Department for replacement of this requirement will be considered to allow time for special interest.

A total of 132 credit hours is required to complete the B. S. degree in chemistry with the natural and synthetic polymer option.

Graduate Program

Recent years have seen profound advances in the fundamental knowledge of chemical areas which have special significance for forestry and the environment. The following research areas have received active attention by both faculty and graduate students in the programs: polymer chemistry and physics; wood chemistry; environmental chemistry; biochemistry; chemistry of natural products, including ecological chemistry; and materials sciences.

Requirements for a master of science or doctor of philosophy degree in chemistry include a research project and thesis, along with an appropriate program of courses at the College and at Syracuse University.

Specific projects may vary from year to year, since they reflect the current interests of the faculty. Current research projects with *physiochemical* emphasis are: the chemistry, physics, solid-state and solution properties of natural and synthetic polymers, including studies in thermodynamics, statistical mechanics, crystallization, morphology, elasticity, conformation of macromolecules, optical properties, polymer catalysis, mechanism of polymerizations, polyelectrolytes, ion binding to macromolecules and ion pairing; chemistry of free radicals, radical ions and charge transfer processes; structure and properties of ionic solutions in nonaqueous media; crystal structure and morphology of cell wall constituents; heavy metal speciation. Current *organic* chemistry programs deal with synthesis of special polymers such as high temperature aromatic block, stereoregular vinyl polymers, and polysaccharides, various aspects of natural products chemistry, but especially alkaloids and terpenes, isolation and characterization of insect and mammalian attractants. An active program on the structure and topochemistry of the *polymeric* wood components, hemicelluloses, lignins and celluloses is underway. In *biochemistry*, department members are studying mechanisms of action of plant growth hormones, biochemical regulation of seed germination, plant enzymology and ultrastructural plant cytology.

Graduate research laboratories in the Hugh P. Baker Laboratory are well equipped for polymer studies, chemical, and biochemical research. Instrumentation includes analytical and preparative ultracentrifuges, Warburg respirometer, recording infrared and ultraviolet spectrophotometers, mass spectrometer, differential refractometer, electron spin resonance spectrometer, nuclear magnetic resonance spectrometers, automatic membrane osmometers, solid-and solution-state light scattering photometers, recording polarimeter and optical dispersion spectrometer, analytical and preparative high performance liquid chromatographs, combined gas chromatographs—mass spectrometry center, spectrofluorimeter, several ultramicrotomes, electron microscopes, X-ray diffraction, instrumentation chromatography and cold laboratories, and radiochemical laboratories with counters for solids, liquids and gases.

INTERDEPARTMENTAL AREA OF STUDY

The following concentration in chemical ecology is offered in collaboration with faculties of the Department of Environmental and Forest Biology and the Department of Chemistry. Interested students should apply to the department of major interest, which will have prime responsibility for setting requirements. Faculty from both departments can aid in the development of a plan of study enabling a student to acquire sophisticated skills in either chemistry or biology and an ample understanding of the other to grapple with problems requiring an understanding of both.

Chemical Ecology

LANIER (Insect Pheromones), LALONDE (Aquatic Plant Secondary Substances), MULLER-SCHWARZE (Vertebrate Pheromones), SILVERSTEIN (Pheromone Chemistry), SIMEONE (Insect Pheromones), TANENBAUM (Microbial Chemistry).

As a relatively new interdisciplinary endeavor, workers in this field attempt to understand organismal interactions, both intra- and interspecific, mediated by chemical substances such as hormones, pheromones, kairomones and phytoalexins. These occur at all taxonomic levels: between uni- and multi-cellular organisms, microbes and plants, plants and plants, plants and animals, microbes and animals, animals and animals. Study of such interactions has been accelerated in recent years through joint efforts of biologists and chemists in meaningful research accompanied by a growing body of literature.

THE SCHOOL OF ENVIRONMENTAL AND RESOURCE ENGINEERING

WILFRED A. CÔTÉ, *Dean* (Cellular Ultrastructure, Light and Electron Microscopy)

The academic program in environmental and resource engineering has as its goal the optimum development and utilization of the forest and other natural resources. The School offers undergraduate and graduate programs in the broad areas of forest engineering, paper science and engineering, and wood products engineering. A bachelor of science degree is awarded in each of these fields while advanced degrees (M.S. and Ph.D.) are offered in Environmental and Resource Engineering. Applicants with backgrounds in chemistry, engineering, physics, mathematics, forestry, or natural sciences can make an easy transition to the desired areas of concentration, but students with other backgrounds can also be accommodated.

The undergraduate curricula and research programs of the School are oriented toward multiple use of forest resources, wood products, paper, and related fibrous materials. Environmental considerations are integrated into the appropriate courses. Among them are recovery and utilization of waste materials, pollution abatement, energy conservation, and safety optimization. The principles and professional skills of engineering analysis and design are stressed in the relevant courses as well as through informal contact which is facilitated by the advantageous student/faculty ratio.

Specific requirements for the B.S. degree are described with the individual programs below. In each curriculum the core of required courses is supplemented by optional courses selected with the consultation of a program advisor. Applicants with associate degrees in engineering science, or science and mathematics, usually gain full admission at the junior level while graduates of two-year technology programs also may qualify for junior standing in a given curriculum if their previous studies include the appropriate courses. These course requirements are indicated with the department listings below.

Advanced studies toward an M.S. or Ph.D. degree provide graduates with a sufficient understanding of the methodologies of scientific research and the principles of engineering. Individually-designed programs at the graduate level may be broad-gauged emphasizing general aspects of the effective utilization of natural resources or may have a sharply focused research orientation. In either case, the student is able to draw on the combined resources of the three academic departments of the School: Forest Engineering, Paper Science and Engineering, and Wood Products Engineering. In addition, courses and facilities of other schools of the College as well as Syracuse University complement those of the School of Environmental and Resource Engineering when appropriate. There is sufficient flexibility in the program elements to provide for a wide variety of career directions. Some examples could include aspects of site evaluation and enhancement, unit and system design, production and processing, qualitative and quantitative measurement, and computation. Unique opportunities in specific areas include water resource engineering, photogrammetry and remote sensing, materials science and engineering of wood products, paper and related materials.

The specialization noted for each member of the faculty within the three departments give further indications of the wide-ranging possibilities offered through graduate study in the School of Environmental and Resource Engineering.

FOREST ENGINEERING

WILLIAM P. TULLY, *Chairman* (Engineering Hydrology, Water Resource Systems, Structures)

BROCK (Photogrammetry, Geodesy, Remote Sensing), DUGGIN (Remote Sensing, Physics, Agricultural Assessment), LEE (Computers and Systems Engineering, Transportation, Soil Mechanics), McCLIMANS (Soils, Hydrology, Drainage), PALMER (Engineering Economics, Energy, Harvesting).

Study and research in the forest engineering department is primarily concerned with engineering analysis and design in concert with other pertinent disciplines for the measurement, assessment, conservation, and holistic development of natural resources, with emphasis on those associated with the forest environment.

The department offers an undergraduate program which leads to the B.S. degree. In this program students are instructed in the planning, design, and construction of systems and facilities to serve the improved utilization of the natural resource base indigenous to the forest environment. Instruction focuses on the engineering activities of: locating and quantifying resources; designing harvesting systems and transportation networks for the sustained high quality yield of water and timber; and designing structures, facilities, and pollution abatement schemes in the planning and development of sites and regions for multiple use. Through the wise use of electives, various program emphases may be developed. A unique opportunity exists for emphasizing photogrammetry and related engineering measurement areas.

Programs of advanced studies toward an M.S. or Ph.D. degree in environmental and resource engineering are offered. Individually designed programs are developed to provide graduates with sufficient understanding of the methodologies of scientific research and of the principles of engineering analysis or design to work with competence in resource related research, engineering design and management. There are unique opportunities for individuals who seek advanced education in such areas as water resource engineering, photogrammetry and remote sensing, and in the more generally defined areas related to forest engineering.

Support for study and research in the forest engineering department is both internal and external. The internal support includes modern laboratory and instrumentation facilities in the Engineering Schools at both ESF and at Syracuse University. Exceptional departmental support exists for programs in environmental engineering measurements in the form of remote sensing and photogrammetric laboratories and the extensive forest properties owned by the College.

External support comes from several active sources, including industrial, commercial, and governmental. Over the past two decades, close cooperation has developed special study and research opportunities with these sources.

Undergraduate Program

The primary objective of this curriculum is to prepare qualified engineering graduates to operate with professional competence within the context of forest and natural resources development. The curriculum is based on basic, forest, and engineering sciences. It utilizes elements of traditional engineering disciplines and develops its unique aspects from interweaving engineering design with an understanding of the natural environment and its renewable resource base including water, soil, timber, wildlife, and amenity values. Studies in the humanities and social and economic sciences are integrated throughout the curriculum to help achieve a broad and balanced perspective of professional practice in forest engineering.

In this program instruction focuses on engineering activities to improve the sustained high quality yield and multiple use benefits of goods and services derived from forested and rural areas. Such activities include locating and quantifying resources; designing harvesting, conveyance, and transportation systems for water and timber; and designing structures, facilities, and pollution abatement schemes in the planning and development of forested sites and rural regions.

Program emphases may be achieved through the wise use of technical design electives. Such emphases may include: resource information systems, forest operations, water resources; wood products; paper science; construction; civil, industrial, mechanical, or environmental engineering.

Because of the special importance of continual measurement and evaluation of the broad scaled parameters which affect the resource base, a unique departmental program emphasis is available for students aiming toward professional careers involving the conceptualization, design, and maintenance of geographically referenced resource information systems. This emphasis includes elements of surveying, photogrammetry, remote sensing, and resource information systems design.

Qualified graduates in search of advanced degree education enjoy ready acceptance to engineering graduate schools throughout the country. Graduates of the Forest Engineering curriculum may enter an established five-year program in either civil, industrial, or mechanical engineering at Syracuse University. A bachelor of science degree in engineering will be awarded by Syracuse University upon completion of the requirements of the fifth year.

To enter this curriculum at the junior level, a transferring student must have acceptable college credit in the following coursework areas or be able to have suitable coursework substitutions for courses listed in the junior and senior years.

Lower Division Courses

Course Area	*Credit Hours*
Biology (Botany preferred) with Laboratory	4
General Chemistry with Laboratory	8
Physics (Engineers and Scientists) with Laboratory	8
Calculus through Differential Equations	15
English	6
Economics (Macro- and Microeconomics)	6
Engineering Drawing (Graphics)	1
Computer Programming (FORTRAN or APL)	3
Engineering Mechanics (Statics)	3
*Engineering Science Electives (Dynamics or Electrical Science)	3
Humanities or Social Science Electives	3
TOTAL MINIMUM LOWER DIVISION CREDITS	60

Students must meet these minimum requirements, and they are encouraged to exceed the minima in the elective areas, to facilitate scheduling during the upper division years.

Upper Division Courses

Junior Year			*Credit Hours*
First Semester	FEG 300	Introduction to Forest Engineering	2
	FEG 371	Surveying for Engineers	3
	FBO 321	General Silviculture	3
	CIE 327	Principles of Fluid Mechanics	4
	*Elective in Engineering Science (Electrical Science I recommended)		3
	**Elective in Dendrology or Structures and Properties		2-3
			17-18
Second Semester	FEG 340	Engineering Hydrology and Flow Controls	4
	FEG 350	Introduction to Remote Sensing	2
	FEG 363	Photogrammetry I	3
	ERE 362	Mechanics of Materials	3
	IOR 326	Statistics for Engineers	3
	Elective		18
			18

Senior Year *Credit Hours*

First Semester	FEG 410	Structures I	4
	FEG 422	Production Systems Engineering	4
	ERM 477	Resource Policy and Management	3
	CIE 437	Soil Mechanics and Foundations I	4
	Elective	Engineering or Technical Forestry	2-3
			17-18
Second Semester	FEG 437	Transportation Systems	4
	FEG 447	Hydrologic and Quality Controls	3
	ERE 488	Engineering Economics	1
	FEG 489	Forest Engineering Planning	3
	***Elective in Engineering Design Sequence		3
	****Elective in Humanities, Social Science, or Technical		3
			17
		TOTAL MINIMUM UPPER DIVISION CREDITS	69

ELECTIVE DISTRIBUTION

*Engineering Science (3 credit hours)
To be chosen from:

Electrical Science I
Electrical Mach. & Devices
Dynamics
Engineering Materials
Thermodynamics

**Dendrology or Wood Technology
(2-3 credit hours)
To be chosen from:

Dendrology I	(3)
Wood Structure & Properties	(2)
Summer Program in Field Forestry	(6)

Note: Extra credits apply to senior year technical forestry elective

***At least 3 credit hours in senior level engineering design or synthesis as part of an advisor approved sequence which complements other required or elected forest engineering coursework—such as:

Photogrammetry II
Survey Systems Design
Design of Wood Structural Elements
Structures II
Soil Mechanics II
Water Pollution Engineering
Treatment of Water and Waste Water
Air Pollution Engineering
Production Systems II
Synthesis of Mechanical Systems

****If the total program requirement of 17 credit hours in humanities or social science requirements have been met, this becomes a free elective. See your advisor.

A total of 129 credit hours is required to complete the B.S. degree in forest engineering.

Graduate Program

Graduate studies and research in the forest engineering department are primarily concerned with environmental and resource related programs. The department's objective is to produce graduates with sufficient understanding of the forest environment and its resources, of the methodologies of scientific research and of the principles of engineering analysis or design to work with competence in resource related research, engineering design and management.

Individually designed programs leading to the master of science and doctor of philosophy degrees are available. Undergraduate backgrounds required depend upon the student's needs and interests in graduate study. The student may emphasize engineering measurements, analysis or design within the department's breadth of engineering concern for environmental influences and resource utilization. Successful programs of graduate study in forest engineering may be efficiently designed by students with bachelor of science degrees in engineering or in forestry, natural sciences, physics or mathematics.

Programs of emphasis on environmental and resource engineering measurements may be designed in remote sensing, photo interpretation, geodetic engineering, analytical photogrammetry and photogrammetric systems. Programs emphasizing engineering analysis and design are available in water resources, energy, transportation, harvesting and site engineering systems. Included are the monitoring, measurement and evaluation of physical parameters affecting water, soil, timber, vegetation and wildlife.

Support for graduate study and research in the forest engineering department is both internal and external. The internal support includes modern laboratory and instrumentation facilities in the Engineering Schools at both ESF and at Syracuse University. Exceptional departmental support exists for programs in environmental engineering measurements in the form of remote sensing and photogrammetric laboratories and the extensive forest properties owned by the College at which research may be conducted.

External support comes from several active sources, including industrial, commercial and governmental. Over the past two decades, close cooperation has developed special study and research opportunities with these sources.

PAPER SCIENCE AND ENGINEERING

BENGT LEOPOLD, *Chairman* (Organic Chemistry and Mechanical Properties of Fibers and Paper)

BAMBACHT (Pulping, Papermaking, Paper Machine Operation), BRITT (Chemistry of Paper Formation), DENCE (Organic Chemistry, Pulping, Bleaching), GORBATSEVICH (Pulping, Bleaching, Paper Technology and Paper Properties), JELINEK (Computer Applications, Process Engineering, Thermodynamics), LUNER (Surface and Colloid Chemistry of Papermaking Systems), MARK (Mechanical Properties of Fibers and Paper), MARTON (Mechanical and High-Yield Pulping), ROTHENBERG (Pulping, Bleaching), STENUF (Chemical Engineering, Instrumentation, Thermodynamics, Flow Phenomena, Process Control, Corrosion), THORPE (Fiber Physics, Paper Physics and Mechanics), TURAI (Water Air Pollution Engineering, Materials Science and Engineering).

Outstanding for its vigorous growth and diversity of products, the pulp and paper industry is the fifth largest in the nation and exceptionally strong worldwide. Its need for professional men and women with training in science, engineering and technology is increasing even more rapidly than the industry itself. The College pioneered instruction in this area in 1920 with the organization of the paper science and engineering department, which has maintained a singularly high position in professional education for the continuing development of the pulp, paper and allied industries. Its graduates, who are in constant demand, occupy positions of leadership throughout the world.

The curriculum in Paper Science and Engineering is designed to provide a broad base of study and to prepare students for a variety of careers in the paper and related industries. Excellent opportunities are provided for men and women qualified to fill positions as research chemists, process engineers, technical service representatives, line management personnel, and many others.

The program provides education in the physical sciences and chemical engineering, with specific emphasis on those aspects of these disciplines which relate to the manufacture of pulp and paper. This includes the chemistry and anatomy of wood, the conversion of wood to pulp and paper, and the chemistry and physics of paper and paper formation. Instruction in chemical engineering includes a foundation of unit operations basic to the pulp and paper industry, as well as specialized courses, such as water and air pollution engineering.

The department is located in Walters Hall, opened in 1969. This facility is devoted exclusively to education and research in the field of pulp and paper. In addition to a large number of special purpose laboratories and highly sophisticated scientific equipment, the department maintains an experimental pulp and paper mill equipped with machinery and instrumentation for studies of pulping, pulp purification, reuse of secondary fibers, refining, paper additives, and papermaking. This facility includes one 12-inch and one 48-inch fourdrinier paper machine, a number of disk refiners, and a two-pocket grinder for mechanical pulping, and auxiliary equipment. Also included is a modern chemical engineering laboratory, designed for studies in all phases of unit operations and processes, process control, and analog simulation.

Undergraduate Program

The curriculum is entered at the junior level. Students with an associate degree in engineering science, science and mathematics, or chemical technology usually qualify for admission if their studies have included 8 credit hours of organic chemistry with laboratory. Other applicants with two years of college study may also gain admission if their curriculum includes the appropriate courses, as indicated below:

Lower Division Courses

Course Area	*Credit Hours*
Botany or Biology with Laboratory	4
General Chemistry with Laboratory	8
Organic Chemistry with Laboratory	8
Quantitative Analysis	3
Physics with Laboratory	8
Mathematics—Analytic Geometry and Calculus, Differential Equations Recommended	12
Computer Science	3
Economics	3
English	6
Engineering Drawing Recommended	1
Humanities or Social Science Electives	8
TOTAL MINIMUM LOWER DIVISION CREDITS	64

Minor deficiencies can usually be made up during the junior year.

The Paper Science and Engineering curriculum consists primarily of chemical engineering courses and specialized courses relating to the manufacture of pulp and paper products. A detailed listing of these courses is given below:

Upper Division Courses

Junior Year

			Credit Hours
First Semester	FCH 475	Wood Chemistry I	2
	FCH 476	Wood Chemistry II	2
	CHE 346	Physical Chemistry	3
	PSE 300	Introduction to Papermaking	3
	WPE 387	Wood Structure and Properties	2
	WPE 388	Wood and Fiber Identification Lab	1
	PSE 370	Principles of Mass and Energy Balance	3
	PSE 371	Fluid Mechanics	2
			18
Second Semester	PSE 372	Heat Transfer	2
	CHE 356	Physical Chemistry	3
	CHE 357	Physical Chemistry Lab	1
	PSE 301	Pulp and Paper Processes	3
	PSE 302	Pulp and Paper Processes Lab	1
	Elective		3
	[1]Engineering Elective		3
			16

SUMMER MILL EXPERIENCE: PSE 304 Mill Experience 2
(Twelve weeks of full-time pulp or paper mill employment approved by the Department between the junior and senior years.)

Senior Year

			Credit Hours
First Semester	PSE 461	Pulping Technology	3
	PSE 465	Paper Properties	4
	PSE 473	Mass Transfer	3
	PSE 491	Paper Science and Engineering— Project I	1
	ERE 440	Water Pollution Engineering	3
	GRA 380	Technical Drawing	1
			15
Second Semester	PSE 466	Paper Coating and Converting	3
	PSE 468	Papermaking Processes	3
	PSE 492	Paper Science and Engineering—Project II	3
	ERM 496	Management Seminar	3
	ERE 441	Air Pollution Engineering	3
			15

TOTAL MINIMUM UPPER DIVISION CREDITS 66

[1]To be selected from ERE 375 (Elementary Corrosion) and ERE 377 (Process Control) or equivalent level, advisor-approved engineering courses.

A total of 130 credit hours is required to complete the B. S. degree in paper science and engineering.

Graduate Program

Graduate studies reflect the strong trend toward diversification in the industry and offer opportunities for obtaining master of science and doctor of philosophy degrees in a variety of subjects related to the manufacture of pulp and paper. Individual study programs are designed to meet specific personal needs. Typical areas of study range from the development of new pulping processes, chemical interactions on the paper machine and the disposal of pulping and papermaking effluents, to the fluid dynamics of fiber suspensions, the colloidal chemistry of papermaking constituents, and the physical properties of fiber networks.

An important component of the graduate program is thesis research under direction of a graduate advisor. Much of this research is carried out under the auspices of one of the outstanding research facilities in the world, the Empire State Paper Research Institute, an integral part of the department. Its research activities aim to generate new information regarding the fundamentals, the science, the engineering and the technology of the papermaking process, utilizing advanced techniques such as electron microscopy, specialized spectrophotometry, nuclear magnetic and electron spin resonance and nuclear tracer methods. Recent work has been directed to fundamental investigations of pulping, bleaching, additives, paper recycling, effluent disposal, the papermaking process, the properties of paper, reactions of wood components during mechanical and chemical treatments, the structure of wood and wood fibers, evaporation, fluid dynamics, heat transfer, and chemical recovery.

Many research projects are carried out in cooperation with other College departments. Examples of such projects include a wide-ranging study of the toxicity of paper industry effluents in cooperation with the Department of Environmental and Forest Biology, and a cooperative project on the theoretical and experimental analysis of the mechanical properties of fiber and paper with the Department of Wood Products Engineering, as well as the Department of Aerospace and Mechanical Engineering at Syracuse University.

The department enjoys excellent external support in the form of graduate fellowships and grants from ESPRI and other industry sources, as well as a number of government granting agencies.

WOOD PRODUCTS ENGINEERING

GEORGE H. KYANKA, *Chairman* (Applied Mechanics, Structures) CÔTÉ (Cellular Ultrastructure, Light and Electron Microscopy), DAVIDSON (Physical Properties of Wood), DE ZEEUW (Wood Anatomy, Structure-Property Relations), MEYER (Wood-Polymer Systems, Radio-Isotope Techniques), MOORE (Bonded Materials Technology), SIAU (Protective Treatments, Transport Processes), L. SMITH (Polymeric Adhesives and Coatings).

While wood is one of the oldest structural materials known to man, it occupies a position of major economic importance today with the annual tonnage of wood produced in the United States far exceeding that of any other major structural material. This fact becomes even more important in this age of environmental and ecological concern because wood is the only major structural material that comes from a *renewable* natural resource, and demand is growing for more efficient utilization of available material. Improved efficiency must be based on solid scientific and engineering information. The Department of Wood Products Engineering provides undergraduate instruction in basic wood science and the application of science and engineering to the production, marketing, and utilization of wood-based materials. At the graduate level, the Department provides advanced courses and research opportunities in wood science and timber engineering.

Undergraduate Program

The Department of Wood Products Engineering prepares students for a wide variety of professional occupations concerned with the use of wood as a material. Two curriculum options are available: Building Construction and Forest Products. Both options have elective courses which permit tailoring the program to serve the needs of individual students.

As the only major construction material derived from a *renewable* natural resource, wood is receiving increased attention as an alternative to other materials which originate from the depleted nonrenewable resources. Thus, a principal aim of the departmental program is to teach students the fundamentals of efficient wood processing, distribution, or final use, whether as a piece of furniture or as a complete building.

To enter either option at the junior level, a transferring student must have acceptable college credit in the following coursework areas:

Lower Division Courses

Course Area	*Credit Hours*
General Chemistry with Laboratory	4
*General Physics with Laboratory	8
Mathematics—Analytical Geometry and Calculus	9
*English	6
Recommended Courses	
Accounting	6
Biology or Botany	3-4
Computer Science	3
Economics (Micro- and Macroeconomics)	6
Engineering Drawing (Graphics)	1
Environmental Geology	3
Electives	13
TOTAL MINIMUM LOWER DIVISION CREDITS	62

*Students planning to enter the forest products option need complete only 4 credits of physics, but they must complete 9 units of English. However, students who wish to emphasize wood science in the forest products option must have: general chemistry with laboratory (8); general physics with laboratory (8); and general botany with laboratory (4).

The A.S. or A.A.S. degree may also fulfill the requirements for admission. Students who lack the above background courses are nevertheless encouraged to consult the Admissions Office and the faculty of the department for an evaluation of their academic records.

Building Construction Option

The current pressures for new housing and urban reconstruction have led to this option which develops a deep awareness of the effects of construction on the environment, as well as the efficient use of materials, particularly wood. There is an increasing demand for technically trained specialists in the construction industry and supporting fields who have the skills to use efficiently the wide variety of wood-based building materials, with consideration to their place in respect to other materials and to the purpose of the end product.

The specialty electives are designed to allow the opportunity for concentration areas related to the individual's career objectives. It is felt the wide range of construction activities found in practice cannot be adequately serviced by a rigid program of study.

Illustrative electives are listed below:

Engineering	*Management*	*Environment*
Structural Analysis	Marketing	Urban Planning
Building Systems	Business Law	Solid Waste Disposal
Adv. Soil Mechanics	Accounting	Waste Water Treatment
Photogrammetry	Finance	Environmental Sanitation
Thermodynamics	Industrial Management	Land Use
Transportation	Operations Research	Landscape Architecture
Systems Analysis	Real Estate	

Upper Division Courses

Junior Year			*Credit Hours*
First Semester	WPE 387	Wood Structure and Properties	2
	FEG 371	Surveying for Engineers	3
	ACC 204	Financial Accounting Systems	3
	Probability and Statistics Course		3
	MEE 221	Statics	3
			14
Second Semester	ERE 362	Mechanics of Materials	3
	ERE 364	Engineering Materials	3
	WPE 320	Polymeric Adhesives and Coatings	2
	WPE 321	Adhesives and Coatings Laboratory	1
	ACC 252	Introduction to Managerial Accounting	3
	Elective		3
			15

Summer Field Experience: WPE 390 Field Trip 2

Senior Year			Credit Hours
First Semester	WPE 422	Composite Materials	3
	FEG 410	Structures	4
	CIE 437	Soil Mechanics and Foundations I	3
	ERE 496	Professional Development	1
	Management Elective Course		3
	Elective		3
			17
Second Semester	WPE 326	Fluid Treatments	2
	WPE 327	Fluid Treatments Laboratory	1
	WPE 450	Construction Equipment	3
	FEG 342	Hydraulics in Construction	4
	Management Elective Course		3
	Elective		3
			16
		TOTAL MINIMUM UPPER DIVISION CREDITS	64

A total of 126 credit hours is required to complete the B. S. degree in wood products engineering with the building construction option.

Forest Products Option

The forest products option is designed to prepare students for employment in the wood products industry. This may be oriented either toward production in manufacturing plants or toward the distribution and marketing segments of the industry. Through careful selection of courses, students can develop an emphasis in marketing, production systems engineering, or wood science.

Students wishing to pursue a career in research related to wood and wood products are accommodated by selection of science courses to fulfill emphasis requirements.

With careful planning and careful selection of electives, students may fulfill the entrance requirements of many universities for a Master in Business Administration program and may be able to obtain an M.B.A. degree after approximately one additional full year of study.

Upper Division Courses

Junior Year			Credit Hours
First Semester	WPE 322	Mechanical Processing	3
	WPE 387	Wood Structure and Properties	2
	WPE 388	Wood and Fiber Identification Laboratory	2
	*Computer Programming Course		3
	*Emphasis Courses		3
	*Electives		3
			16
Second Semester	WPE 320	Polymer Adhesives and Coatings	2
	WPE 321	Adhesives and Coatings Laboratory	1
	WPE 326	Fluid Treatments	2
	WPE 327	Fluid Treatments Laboratory	1
	ERE 362 or LSA 343	Mechanics of Materials or Structural Materials and Elements	3
	*Emphasis Courses		3
	*Electives		3
			15

Summer Field Experience: WPE 390 Field Trip 2

Senior Year			Credit Hours
First Semester	WPE 422	Composite Materials	3
	Probability and Statistics Course		3
	WPE 497	Seminar	2
	*Emphasis Courses		6
	*Electives		3
			17
Second Semester	WPE 404	Design of Wood Structural Elements	3
	*Emphasis Courses		9
	*Electives		3
			15
		TOTAL MINIMUM UPPER DIVISION CREDITS	65

*Specific courses selected for these requirements must have the advisor's approval.

A total of 127 credit hours is required to complete the B.S. degree in wood products engineering with the forest products option.

Emphasis Courses

A student desiring to emphasize MARKETING should select 24 credit hours from the following listing of courses:

First Semester			*Second Semester*		
ERM 206	Microeconomics	3	ERM 205	Macroeconomics	3
WPE 442	Light Construction	3	ERM 404	Economics of Wood-Using Industries	3
LPP 355	Intro. Legal System	3	LSA 343	Structural Materials and Elements	3
MAR 355	Marketing and Society	3	ERE 364	Engineering Materials	3
FIN 355	Money and Banking	3	WPE 444	Materials Marketing	3
ACC 204	Financial Accounting	3	ACC 252	Intro. to Managerial Accounting	3

A student desiring to emphasize PRODUCTION SYSTEMS ENGINEERING should select 24 credit hours from the following listing of courses:

First Semester			*Second Semester*		
MEE 221	Statics	3	MEE 351	Fundamentals of Thermodynamics	3
ECE 221	Electrical Science I	3	ECE 222	Electrical Science II	3
IOR 548	Engrg. Econ. Anal.	3	ERM 461	Oper. Cost. Cont.	3
IOR 575	Ind. Meth. and Syst. Engr.	3	IOR 326	Stat. Methods for Eng. II	3
WPE 498	Design Problem	3	IOR 527	Human Factors in Eng.	3
IOR 325	Statis. Methods for Eng. I	3	IOR 536	Material Handling	3
IOR 521	Motion and Time Study	3			
IOR 534	Stat. Quality Control	3			

A student desiring to emphasize WOOD SCIENCE should select 24 credit hours from the following listing of courses:

First Semester			*Second Semester*		
FBO 315	Dendrology	3	FBO 585	Plant Anatomy	3
CHE 346	Physical Chemistry	3	CHE 356	Physical Chemistry	3
PHY 361	Intro. Modern Phys.	3	FCH 520	Nucl. and Rad. Chem.	2
MEE 221	Statics	3	FCH 521	Nucl. Chem. Tech.	1
APM 360	Intro. Comp. Prog.	3	MEE 222	Dynamics	3
WPE 498	Design Problem	3	WPE 688	Tropical Timbers	2
			WPE 689	Tropical Wood Anatomy	1
			FBL 330	General Physiology	3

Graduate Program

Basic degree requirements for either a master of science or a doctor of philosophy degree include (1) appropriate coursework, which prepares the student to undertake (2) a research project culminating in the writing of a thesis.

Recent research projects in wood ultrastructure have dealt with the interaction of coatings and adhesives with the wood substrate, with cell wall development, with the effectiveness of wood preservatives, and with the identification of natural inclusions in wood. Projects in tropical wood identification and structure-property relations in foreign timbers are examples of work in the field of systematic wood anatomy. The field of wood physics has had active projects in the permeability of wood and the mechanics of fluid transport. Current projects in the field of mechanics are in the mechanical behavior of fiber networks, fracture mechanics of wood, the behavior of new structural designs, and the mechanical properties of laminated-veneer-lumber. In addition, there is growing interest in studying the properties of wood-based composite materials and the chemical modification of wood.

Laboratory facilities include a modern mechanical testing laboratory which has a wide range of testing machines, a well-equipped physics laboratory with electronic instrumentation, and complete wood processing facilities including a sawmill, plywood mill, dry kilns, and wood preservation equipment. An intensive foreign wood collection is used for graduate research and to support the program of the Tropical Timber Information Center (TTIC).

In addition, the College has available a complete microscopy laboratory, containing both scanning and transmission electron microscopes, a wide variety of light microscopes, and related equipment. Extensive equipment for chemical analysis and nuclear chemical techniques also serve the research program.

COLLEGE-WIDE PROGRAM IN ENVIRONMENTAL SCIENCE

ROBERT D. HENNIGAN, *Director* (Environmental Management, Policy and Programming, Water Quality and Urban Water Management), ALEXANDER (Wildlife Biology, Wetland Ecology), BENNETT (Forestry Economics), BLACK (Watershed Hydrology, Water Quality), BROCK (Analytic and Interpretative Photogrammetry, Remote Sensing), CANHAM (Resource and Land Use Economics, Regional Planning), CHAMBERS (Wildlife Ecology and Management), CUNIA (Operations Research, Statistics, Mensuration), CURRY (Urban Visual Analysis, General Urban Design), DENCE (Organic Chemistry and Lignin Reactions), FELLEMAN (Site Engineering, Environmental Land Use Planning), GEIS (Plant Community Dynamics, Plant-Soil Relationships), GRATZER (Recreation Resource Management and Planning), GRAVES (Resources and Environmental Management, Policy Analysis), HANNA (Transmission Electron Microscopy, Cellular Ultrastructure), HANSELMAN (Education and Communications Strategies, Learning Simulations), HARPER (Regional Resources Analysis, Scenic Assessment), HARTENSTEIN (Soil Macroinvertebrates, Biodegradation), HORN (Legal and Business Aspects of Resources Management and Policy), JELINEK (Computer Applications, Process Design), JOHNSON (Speciation of Heavy Metals in Air, Water and Other Materials), LEE (Systems Engineering Computers, Soil Mechanics), LEWIS (City and Regional Planning, Systems Dynamics), LUNER (Mechanical and Surface Properties of Fibers, Films and Paper), MARK (Properties of Woods and Fibers, Solid Mechanics of Cell Walls), MEYER (Wood Polymers, Radiation Chemistry), MITCHELL (Decomposition Processes, Flora-Faunal Interactions), NAKATSUGAWA (Detoxification Mechanisms, Health Effects of Pesticides, Pollutants), PALMER (Biomass Energy Systems; Engineering Economics), PAULO (Design, Land Use Planning), POLLAK (Public Policy Decisionmaking, Analysis of Urban Areas), PORTER (Nature Interpretation, Wildlife Habitat Research), RAYNAL (Plant Populations, Community Ecology), SMITH (Physical and Polymer Chemistry), TULLY (Computer Modeling of Stormwater Runoff, Relationships between Hydrologic Models and Water Resources Decisions), VAN DRUFF (Urban Wildlife, Wetland and Waterfowl Biology).

Adjunct Faculty

J. ALEXANDER, ROBERTSON, ROWNTREE, THOMPSON, WEEKS.

A PERSPECTIVE

Environmental science is the study of people and their relationships with the environment. The environment is the physical, chemical, biological, and social setting in which people live, work, and play. Consequently, environmental science is concerned with the natural setting, the culture imposed by man in this setting, and the institutional system man has devised to order the relationships between many conflicting demands and desires in light of natural and social constraints. Few, if any, locations on this earth are totally independent; external dependencies and impacts exist, to a greater or lesser degree, and must be factored into this environmental matrix.

Environmental science connotes a holistic orientation, one that recognizes interdependence and interrelatedness of all the social and technical facets of the environment, as opposed to an atomistic orientation which treats these facets as fragmented and unrelated. Armed with this perspective, it is apparent that the environmental problems facing society today are a product of human interaction with the environment, not simply a number of technological difficulties.

Present day interest and concern with environmental matters had as its antecedents the separate development of conservation and public health programs in the 1880s which had a rather narrow focus. These concerns became progressively broader under the press of social and technological growth in the 40s, 50s, and 60s. A new environmental movement then emerged outside of these traditional approaches culminating in Earth Day, 1970.

This environmental movement enlisted a constituency outside of the conservation and public health traditions and agencies. Conservation and public health elements were combined in a unified approach. The resource focus of conservation and the people focus of public health became merged into the single focus of people and resources. The goal is to maintain acceptable environmental conditions, while simultaneously providing for the effective utilization of resources.

In order to meet the demands for a broader integrative approach to environmental affairs, a number of new statutes were passed, epitomized by the National Environmental Policy Act; new agencies were formed, old agencies were reorganized. The new participants included citizen activists, lawyers, natural scientists, and planners in unprecedented numbers to add to the cadre of professionals and citizen activists from the public health and conservation traditions. One major result of this was the realization that the environment must be viewed holistically, and that there were two major aspects to all environmental issues, the technical-scientific, and the political-social. This requires that all students of environmental science fully understand and comprehend both of these components of environmental affairs.

THE PROGRAM

The Graduate Program in Environmental Science resulted from the realization that there is a need to provide an opportunity for interdepartmental and interdisciplinary study. Consequently, the faculty for the program is drawn from the faculty of the existing schools and departments.

Other important inputs to this program are the resources of Syracuse University in the coursework areas of communications, policy, law, engineering, science, sociology and political science, and the community and institutional resources of the region such as federal, state, and local agencies, faculties of other colleges, and private organizations.

PROGRAM OBJECTIVES

The GPES is designed to prepare graduate students for careers in environmental affairs. This includes working in such diverse areas as teaching and research, communications, planning, regulatory administration, general administration, policy and program analysis. The emphasis can be technical-scientific or institutional-social with varying blends of the two.

Students enter directly from undergraduate schools or, as is increasingly happening, after some years of professional experience. The goals of the entering students vary considerably, such as development of needed career skills and expertise, career changes, adding breadth to a technical background, adding depth to a general background, and mid-career updating.

AREAS OF STUDY

The areas of concentration now being offered under the GPES are environmental education/communication, environmental assessment and impact analysis, environmental land use planning, and water resources. These areas are not exclusionary. It may well be that a student will desire a program that does not fall into the listed categories. This need can be met providing that the faculty resources are available in the College and associated institutions. Students with a desire for a highly individualized program falling within the scope of the College's offerings are encouraged to make application for admission.

Students with an undergraduate major in engineering, science, mathematics, political science, economics, journalism, public communications, or forestry would be best prepared to undertake a graduate program in environmental science. All applicants must meet the general admission requirements of ESF. Each applicant is evaluated on an individual basis, and judgment is exercised if the student appears to be deficient in some aspects. Considerations include years of experience, maturity, and motivation. Potential applicants should not hesitate to submit applications for consideration. All applicants are urged to visit the campus and confer with appropriate faculty and administrative personnel.

REQUIREMENTS

Program requirements are designed on a highly individual basis. The purpose is to design a program that fits the students' particular needs, goals, and preparation. Each program must meet the need for *depth* in a particular area, *breadth* across the environmental spectrum, and *synthesis* of information and analysis in evaluating environmental situations. Program evaluation is based on undergraduate work and experience, as well as courses taken at the College. The program must also be coherent, logical, and result in a meaningful whole. Current areas of study are:

Environmental Education/Communication

The Environmental Education/Communication area of study is concerned with those facets of environmental protection, enhancement, management, and design in which the flow of information and the processes of education are integral to end results. The basic emphasis is to integrate a solid and substantial background in environmental science with a mastery of appropriate education and communications theory and practice in such a manner as to prepare students in the program for careers in environmental education and communications.

Although closely related, there are several rather distinct career areas under the umbrella of EE/C for which this program unit provides preparatory graduate degree training. These career areas can be generally categorized as follows: Public Information Officer, Environmental Education Specialist, Extension Specialist, Interpretive Naturalist, Environmental Journalist.

Water Resources

The Water Resources area of study is based on the recognition that water relationships are important in almost every aspect of human concern and merit attention as integrative and central elements rather than accessories.

The thrust of the program is either technical or social depending on student interest. The technical is concerned with water quality and quantity relationships, their quantifications and determinants. The social aspect is concerned with planning, regulation, law and institutions, and management. National concern with water resources planning, water supply, and water pollution control attest to the need for people trained in these areas.

Environmental Assessment and Impact Analysis

The main objective of this area of study is to bring together, in an organized educational unit, the various skills and disciplines required for an environmental impact analysis. In practice, such an analysis is a team effort, and the program is intended to ensure that potential team members are conversant with, and operationally adapted to, the language and procedures of a number of the disciplines involved. Starting with students who have an in-depth background in a traditional (i.e., chemistry, biology, engineering, ecology, forestry, et al.) discipline, the program seeks to refine existing strengths while at the same time broadening the students' ability to deal effectively with the complex, interdisciplinary problems which arise in studies of environmental impact. To ensure the depth and breadth aspects simultaneously, the academic plan stresses a problem-oriented team research approach.

Environmental Land Use Planning

The land use planning area of study is based on the concept that land use is a fundamental determinant of environmental conditions, be it water pollution, air pollution, population density, solid waste disposal, or other impacts. The program is designed to acquaint the student with the physical elements of land use such as location and natural resources, and the social side relating to law, economics, and regulation. Land use management and control is fast becoming the major environmental issue of the day. Land use planners and implementors are sorely needed on a local and regional level. This program unit proposes to meet that need.

Environmental Science

This is not a specific area of study but a program element to provide for the highly individual program designed to meet a particular student's needs. The emphasis can be on any appropriate subject within the resources of the College and related institutions.

THE STUDENT

A major advisor is assigned by the program director to accept primary responsibility for the program of each student. Two additional faculty members in areas of expected academic or research emphasis are also selected. These three faculty members constitute the academic program committee for the student. The student is required to submit a formal proposal to the committee consisting of a detailed plan describing and defending the academics and research objectives of the program and a schedule of courses to be taken. The plan is reviewed and updated at the beginning of each semester. The program committee also serves as the thesis or project committee.

The program operates within the College-wide requirements for graduate students. All students in the program are required to participate in the environmental science seminar which brings together a variety of lecturers with a wide spectrum of interest. Communication, and a campus visit and an interview are highly recommended prior to or during the application process.

THE SCHOOL OF FORESTRY

JOHN V. BERGLUND, *Dean* (Silvics, Silviculture)

ABRAHAMSON (Entomology, Pathology, Pesticides), ARMSTRONG (Industrial Economics, International Forestry), BENNETT (Economic Theory, Economic Thought in Forestry), BLACK (Watershed Management), BURRY (Forestry Extension, Primary Processing), CANHAM (Economics of Non-Market Forest Resources), CRAUL (Forest Soil Science), CUNIA (Operations Research, Statistics, Mensuration), ESCHNER (Forest Influences), FISHER (Forestry Extension, Woodlot Management), GRATZER (Forest Recreation, Forest Management), GRAVES (Forest Resource Policy, Planning, and Management), HERRINGTON (Meteorology, Urban Forestry), HORN (Forest Business Management, Law), HOWARD (Silvics, Forest Management), KAUFMAN (Tropical Silviculture), KOTEN (Forest Management, Systems Analysis), LARSON (Forest Resource Policy and Administration, International Forestry), LEA (Silviculture, Timber Harvesting), LEAF (Forest Soil Science), MONTEITH (Forestry Economics, Land Use), NYLAND (Silviculture), PETRICEKS (International Forestry Economics, Macroeconomics), RICHARDS (Silviculture, Urban Forestry), SAGE (Huntington Forest), STITELER (Biometry, Experimental Design, Computer Applications), TIERSON (Adirondack Ecological Center), WESTFALL (Physiology-Genetics, Tree Improvement), YAVORSKY (International Forestry).

Adjunct Faculty

HEISLER (Meteorology), HORSELEY (Silvics), MARQUIS (Silviculture)

UNDERGRADUATE STUDY

The School of Forestry prepares students for the critical role of managing forests and related resources and their associated environments for human benefit. Management in this sense embraces the integration of basic ecological and social principles into comprehensive programs of planning, manipulation, and use of forest and open lands for the sustained production of timber, forage, water, wildlife, and recreational values consistent with national needs and the protection and enhancement of environmental quality. It includes, further, the effective implementation of these programs via the administrative process, in accordance with established policies and goals and in cooperation with individuals and organizations, both public and private.

Students completing the School's undergraduate program are qualified for professional practice as foresters and environmental managers with public and private organizations or as private consultants serving a wide array of clients. The potential for a meaningful career in service to human welfare becomes significant when one recognizes the vast amount of land area covered by forests. Nearly 60 percent of New York State is classified as forest land, while roughly one-third of the land area of both the United States and the world is so classified. The goods and services that flow from this vast resource base are of critical and growing importance to the needs of modern society and influence: in a major way, the quality of the environment.

The program also offers opportunity for students to pursue special interests, to prepare for advanced study, or to develop their capabilities for service in a variety of fields pertinent to renewable natural resources and the environment, but not specifically forestry oriented.

The Forest Management Curriculum

Though it represents the oldest area of professional instruction in the College, the current curriculum was implemented with the entering class in 1973. A core of required upper division courses, totaling 42 semester hours, presents the basic principles and practices that underlie the purposeful management of forest and related resources for optimum production and use of any one, or more, of their potential products and services.

Extensive elective opportunities, totaling over one-fourth of the program, are available to help broaden the student's general education, to strengthen perceptions and integration of knowledge, to enable the student to enhance depth of understanding in areas of environmental and forest resource management of special interest, or as a base for subsequent study at the graduate level. Areas of concentration provide meaningful sequences in terms of subject matter coverage. Such areas currently include forest resource science, management science, urban forestry, international forestry, and applied forest resource management within any of which emphasis may be focused on multiple-use forest management, or on single-use values such as timber, forage, watershed, wildlife, recreation, and aesthetics.

Additional areas of concentration may be developed in cooperation with other disciplinary units of the College. Moreover, students need not select a given area of concentration, but may choose elective courses in accordance with their respective interests and needs, the only restriction being that such selections have the approval of the student's faculty advisor.

A significant feature of the elective component of the curriculum in forest resource management is that the spring semester of the senior year consists wholly of electives and thus is available for a variety of independent or group study activities. These may be conducted in whole or in part on any one of the College's several campuses, off campus at another institution, in cooperation with some resource management agency or firm, or in conjunction with an overseas academic program operated by the College. Proposals for off-campus study are subject to faculty review and are carried out with varying degrees of faculty guidance to ensure adherence to academic standards.

Considerable emphasis in the curriculum is placed on field instruction to provide students with intimate knowledge of how the forest ecosystem functions and how it is manipulated and used for a variety of owner objectives. Attendance at a five-week, six-credit hour Summer Session in Field Forestry is required prior to registration for the junior year. This session serves as the major avenue of entrance into the curriculum.

Close to half of the required upper division core courses are conducted wholly or primarily in the forest environment and entail substantial physical activity such as conducting field surveys, inventorying timber and other resources, thinning forest stands, and planting trees. As part of the conditions for admission to this program, applicants must be willing and able to function effectively in the field under a wide range of terrain and weather conditions. Any questions or concerns about this requirement should be directed to the Director of Admissions.

The curriculum is designed to facilitate the transfer of qualified students from liberal arts and science programs in community colleges and other institutions of higher learning. For students contemplating such transfer, it is required they have completed at least 64 semester credit hours or an associate degree, and further, that they have a minimum of 48 of these credits distributed among specific course areas as outlined below. The maximum number of freshman-sophomore semester credit hours which may be transferred is 64. Up to 12 additional hours of junior-senior level courses may be transferred.

Lower Division Courses

Course Area	*Credit Hours*
Biology (Botany and Zoology) with Laboratory	8
General Chemistry with Laboratory	8
General Physics with Laboratory	8
Mathematics, through Integral Calculus	6
Economics (Macro- and Microeconomics)	6
*Introductory Sociology or Psychology	3
*Political Science (U.S. Institutions)	3
English	6
*Electives	16
TOTAL MINIMUM LOWER DIVISION CREDITS	64

*The professional resource manager must have a basic understanding of the complex interrelationships that exist within the forest ecosystems. It is equally important that such professionals have a knowledge of the social, cultural, and historic influences that impinge upon the protection, development, and use of forest land resources. Accordingly, prospective transfer students should choose elective courses that will serve to broaden and enhance their understanding in the social and political sciences, humanities, and communication skills.

Upper Division Courses

Summer:	[1]ERM 300	Summer Program in Field Forestry	6
Junior Year			
First Semester	FOR 331	Introduction to the Physical Environment	6
	FOR 332	Silvics-Silviculture	8
	FOR 322	Forest Mensuration	3
			17
Second Semester	FOR 360	Principles of Management	3
	FOR 370	Management of the Forest Enterprise	3
	Computer Science Course		1
	APM 391	Introduction to Probability and Statistics	3
	[2]Electives		6
			16
Senior Year			
First Semester	APM 492	Forest Biometrics	3
	FOR 400	The Social Environment of Resource Management	3
	FOR 461	Management Models	3
	[2]Electives		6
			15
Second Semester	Electives		17
			17
		TOTAL MINIMUM UPPER DIVISION CREDITS	71

[1]SUMMER PROGRAM IN FIELD FORESTRY—five weeks, 6 credit hours: Required of all students *prior* to registration for the junior year. One half of the student's elective hours during the junior and senior years must be in courses taken in no fewer than three of the following Schools: Forestry; Environmental and Resource Engineering; Biology, Chemistry, and Ecology; Landscape Architecture. The remaining elective hours should be used to round out the professional education of a student.

A total of 135 credit hours is required to complete the B.S. degree in resource management.

GRADUATE STUDY

Graduate education in the School of Forestry builds upon the basic foundation of professional knowledge acquired by students in its undergraduate curriculum or in similar or closely allied programs of study. Instruction at this level is designed to prepare students for careers in resource administration, professional education and research, and a variety of other specialized positions in public and private employment bearing directly or indirectly on forest resources management.

The School offers advanced study opportunities under two broad degree programs: Forest Resource Management and Policy, and Silviculture and Forest Influences. In addition, its faculty contribute significantly to several College-wide graduate programs and joint areas of advanced study, including fish and wildlife, managerial science, water resources, environmental planning, environmental science, and soils science.

Several areas of specialization are available within the two degree programs. Opportunity is also provided for students, in consultation with faculty advisors, to arrange areas of study specific to their interests and needs which integrate elements of two or more areas of specialization, as in urban forestry and international forestry. Whatever the program, the basic purpose is to help the student acquire the tools and facility for disciplined, logical, critical, constructive, and creative thinking, and for clear expression in the selected field.

Prospective students who desire more information than is presented for each of the graduate programs and specialties described below should contact the Dean, School of Forestry.

RESOURCE MANAGEMENT AND POLICY

Today's successful resource manager is one who can anticipate and prevent environmental troubles as well as attempt to remedy them; who is equipped not only to make current institutions function effectively, but also to create new ones better fitted to changing social needs; and who can bring the strengths of many disciplines to bear on vexing environmental problems.

The graduate program in Resource Management and Policy is designed to meet the needs of students for broad theoretical education and training in techniques for application in a variety of resource conservation fields. Students have options to emphasize studies in applied fields but each individual must make selections, with faculty approval, to comprise a meaningful, coherent, interdisciplinary study plan. Applied fields are described below and include forest management, forestry economics, policy and administration, educational communications, forest land use planning, quantitative methods, and recreation management. Typically, the study plan is designed by an individual in consultation with a major professor and other members of the faculty as the case may require. The criteria used include the student's undergraduate preparation, his study and career objectives, and our institutional capabilities. Courses are selected from the departmental offerings, the offerings of other departments of the College (described in this catalog), and those of Syracuse University.

Master's Degree Program

The entering student is expected to have a body of knowledge obtained through undergraduate study which includes biological, physical, and social sciences. Graduates from such programs as forestry, agriculture, wildlife management, watershed management, or liberal arts, with a sufficient background in the sciences, should qualify. In a number of cases, students will have to make up for the lack of required knowledge by taking undergraduate courses.

During the first year, all students in the program are required to take four core courses, in order to obtain a minimal base for becoming qualified for professional service in resource management and policy. These four courses are:

RMP 601 - Resource Management Systems
RMP 602 - Resource Economics
RMP 603 - Research Methods in Resource Management and Policy
RMP 753 - Resources Policy

The remaining coursework will be built around such subdivisions of the program as forest management, quantitative methods, land use planning, recreation management, policy and administration, and forestry (resource) economics.

A thesis is also required. The approach to thesis writing may be based on collection and interpretation of primary data, or emphasis may be placed on reading and secondary data, thus acquiring additional knowledge in an area of resource management and policy chosen by the student.

The total credit requirement is 30 semester hours, including the thesis. The normal time for completing these requirements is three semesters.

Ph.D. Degree Program

Requirements for the doctorate usually build upon a master's degree, and demand a substantial mastery of material related to the dissertation topic. At the same time, a number of other fields are chosen to support or integrate the selected central topic of doctoral study. There is no minimum credit requirement, but the normal course workload is 30 credits. The field work for and the writing of a dissertation usually requires a minimum of 12 months.

The additional requirements for a doctoral program, beyond a master's degree, are a residence of two continuous semesters, the passing of written and oral comprehensive examinations which are intended to test the student's integration of subject matter, and the writing and successful defense of a dissertation.

The topics for a doctoral dissertation would typically fall within one of the areas mentioned for master's study, namely forest management, quantitative methods, land use planning, recreation management, policy and administration, and economics. A brief description of these areas follows.

FOREST MANAGEMENT

The forest management area focuses on the planning and implementation processes necessary to achieve integrated use of forests and related resources. The objective is to develop expertise sufficient for capable, professional resource management to satisfy a wide range of societal needs.

Broad knowledge of the operation of both biological and social systems is combined with skill in the use of managerial tools. Concepts in decision theory, and information and organization theory, particularly, are applied to representative cases at varying levels of complexity. Syracuse University's School of Management and Maxwell Graduate School of Citizenship and Public Affairs offer a broad array of support courses. Students prepare themselves for any of a wide range of positions in research, program analysis, teaching, administration, budgeting and other phases of forest resource management with federal and state agencies and private firms.

RECREATION MANAGEMENT

Graduate study in this area equips students with a broad understanding of the nature and purposes of outdoor recreation and how they relate to natural resources, and builds the skills necessary for capable recreation management.

Individual programs combine study in resources management with relevant studies in the social sciences and development of analytical and political capabilities needed to implement plans and programs. Other schools of the College and of Syracuse University, treating such areas as planning, engineering, design, and education, provide a wide range of supporting courses and facilities.

POLICY AND ADMINISTRATION

Graduate study in the area of policy and administration prepares students for the broad range of responsibilities comprising the field of program administration in a public agency or a business at the executive, planning, budgeting, programming or operating levels. Advanced courses, special problems and seminars structured around human relationships to resources, resources policy issues, administrative management, and environmental law are offered.

Students are encouraged to round out their academic programs through the offerings of other units of the College as well as the Syracuse University Maxwell Graduate School of Citizenship and Public Affairs and the School of Management.

The wide-ranging possibilities of course selection and the differing points of view that are available allow the student to tailor a program to meet specific career objectives. This breadth and diversity also offers the student an opportunity to develop talents for top executive leadership in various aspects of a field that is critical to the future of resource management.

FORESTRY ECONOMICS

In this area, study at the master's level is designed to meet the needs of the graduate in forestry or forest products. It also serves the graduate in liberal arts, engineering or business whose interests point toward the economics of forest resource management. The aim is primarily to broaden the student's understanding of the content of forestry economics.

The Ph.D. program is for those who wish to make a career as professional forestry economists in research institutions, in the academic world, or in business or government. The goals are depth of understanding and familiarity with economic tools contributory to making competent decisions in resource economics, management, and policy. Requirements are generally the same as those observed in economics departments of leading universities, except that the student completes specified work in the economics of forestry.

Individual programs may include supporting courses in general economics, mathematics and statistics, operations research, business, international affairs, and other social sciences and related fields. The broad array of course offerings and substantial library resources, computer facilities and other resources of Syracuse University supplement those of the College.

QUANTITATIVE METHODS

Study in the area of quantitative methods is designed to develop professionals skilled in mathematical and statistical problem solution, and equipped to act as biometricians, mensurationists or in similar posts with state and federal agencies and with private firms.

The program is designed primarily for students who have done their undergraduate work in areas such as biological sciences, forestry, wildlife, or agriculture. Others, who lack background courses, may take this material concurrently. Students may concentrate in statistics, operations research, biometry, or forest mensuration. Syracuse University's IBM 370 computer, programming banks, and a wide range of courses in mathematics, statistics, and quantitative methods, give strong support to the program.

FOREST LAND USE PLANNING

Graduate study in forest land use planning aims to show how development and utilization of forest and associated wildlands are affect and affected by natural and social systems. It provides basic understanding of the tools and processes of planning, and addresses land use policy issues. Student programs are flexible and draw heavily from course offerings in resource economics, resource policy and administration, open space planning, and applied ecology. In addition, the rich course offerings of other Schools and Syracuse University in such areas as remote sensing, geography, and metropolitan studies are available. Some undergraduate work in the natural and social sciences is required.

Employers normally include federal agencies such as the Forest Service, Bureau of Land Management, and private consulting firms, as well as county, regional, and state planning commissions. Consultation from these sources is encouraged in graduate theses and research, and in the conduct of seminars.

Graduates find employment in resource management agencies administering recreation areas; in national, state, and local parks and recreation departments; in educational institutions; and in private organizations involved in recreation.

SILVICULTURE AND FOREST INFLUENCES

Concern for the forest ecosystem provides a major focus for graduate study in the Silviculture and Forest Influences Program. This ecosystem is viewed as a producer of goods and services and as a modifier of the physical environment in which man lives. It is in this context that translation of these concerns to broader questions of environmental quality is emphasized.

Silviculture in its functional sense is the bridge between fundamental biological and physical relationships and the applications of these relationships in the forest environment. Thus, graduate study in the many aspects of silviculture can cover a broad spectrum of disciplines, and can be as basic or as applied as the objectives of the student indicate. Individual study programs are coordinated with various areas of specialization both within the School of Forestry and with other departments of the College, of the State University of New York, and with Syracuse University. A major strength is the close association of faculty scientists, representing a wide range of specialties, and the formal and informal cooperative arrangements they have developed with their counterparts in federal and state agencies, and in industry.

Physical facilities that are routinely used in graduate study within the Silviculture Program include well-equipped laboratories, specialized equipment, greenhouse facilities, and extensive College forests.On these 25,000 acres of forestlands are located natural and planted stands, seed orchards, a forest tree nursery, and two large micro-climate tower complexes with associated automated data acquisition systems and instrumentation. Major field installations include long-term northern hardwood stand improvement studies and the oldest continuous forest fertilization study in the United States. Cooperative arrangements also exist for work on corporate lands, private properties, and governmental ownerships.

Qualifications for Admission

In addition to the general College-wide requirements for admission to graduate study, applicants to the graduate program in Silviculture and Forest Influences should have prior education or experience in resource management and have a deep personal commitment to forest resource management as a career goal. Students with preparatory deficiencies may be permitted to take corrective coursework.

Minimum Requirements

MASTER OF SCIENCE

Candidates for the master of science degree are required to complete two semesters in residence and 30 semester hours of graduate work beyond the baccalaureate degree. From 6 to 12 semester hours of this total can be credited for writing and defending a thesis.

DOCTOR OF PHILOSOPHY

The Ph.D. program usually builds upon a master's degree and demands substantial mastery of material related to the dissertation topic. At the same time, a number of other fields are chosen to support or integrate the selected central topic of doctoral study. There is no minimum credit requirement but the normal course workload is 30 graduate credits beyond the master's degree. In addition, the fieldwork for and the writing of the dissertation usually requires a minimum of 12 months.

Candidates for the Ph.D. degree must be in residence for two continuous semesters, pass a written and oral comprehensive examination, and write and defend a dissertation.

At both the M.S. and Ph.D. levels, students may or may not be required to demonstrate competency in one or more foreign languages or research tools, depending upon their area of orientation and career goals.

Fields of Specialization

Included within the Silviculture and Forest Influences Program are five fields of specialization that, singly or in combination, provide the graduate student with a wide array of coursework, research activities, and faculty guidance all aimed at enhancing understanding of the forest ecosystem. These specializations are silvics, silviculture, forest soil science, tree improvement, and forest influences. Students in the program can direct their studies toward careers in professional practice, research, or education. Similarly, study in these specialty areas can emphasize any of a number of areas of professional application, such as public or private forest management, urban forestry, or international forestry, depending on the individual's interest.

SILVICS

Silvics has been defined as that branch of forestry which provides the scientific base for the cultural treatment of forest vegetation by (1) studying and defining interrelationships within forest ecosystems and (2) cataloging general intraspecific characteristics of tree species. In a sense, silvics is the ecology of managed forest ecosystems, although unmanaged and natural forests are often studied intensively to provide the benchmark conditions from which the silviculturist begins.

The specialist in silvics must maintain channels of communication with colleagues in the basic disciplines, including those in soil physics, soil chemistry, micro-meteorology and climatology, genetics and tree breedings, plant ecology and physiology, wildlife biology, entomology, and pathology. In addition, certain tools, including a comprehensive knowledge of probability and statistics, the ability to use modern computers effectively, and a familiarity with measurement and sampling theory, are required by specialists in most applied sciences including silvics.

The specialist in silvics is essentially at one focal point of much of what has been called fundamental forest research. His most useful function and worthwhile contribution to the field of forestry may very well depend on the ability to synthesize relevant material and, through experimentation, provide the silviculturist with information and possible techniques for use in the cultural treatment of forest vegetation.

SILVICULTURE

Classical silviculture can be defined as the theory and practice of the manipulation of forest ecosystems, including the control of vegetation establishment, composition, growth, and quality. The nature of cultural treatments, the theories upon which they are based, and the biological, physical, and social constraints to their implementation are stressed in this area of specialization. Elements of forest vegetation are intensively examined from the dual standpoints of fulfilling management goals for goods and services and maintaining or enhancing biotic productivity for the future.

Management goals are considered to include all the many and varied goods and services that the basic forest resource is capable of supplying. Forest productivity is of basic concern; the student specializing in this area progresses through formal coursework and research toward an understanding of the effect of various treatments on the continuous, balanced, and adequate supplies of wood, water, wildlife, recreation opportunities, and amenity values. One major area of emphasis within this specialization relates to treatment of tree stands for their continued production of wood products and other commodities. Another emphasis centers on the treatment of stands that are managed for several values simultaneously, where the harmonious integration of uses is of concern. A third emphasis focuses on evalution and manipulation of vegetation systems primarily for their on-site values, such as in wilderness and recreation areas, highway and utility rights-of-way, mining and other wasteland reclamation, and urban greenspace. This involves a broad interpretation of forest ecosystems that includes herbaceous and shrub systems as well as silvics.

The Silviculture graduate specialization is aimed at preparing foresters to understand and evaluate forest ecosystems in whatever depth may be required, and to prescribe treatments or further experimentation to attain management objectives or increase knowledge toward this end.

FOREST SOIL SCIENCE

Graduate studies in this area of specialization may be directed toward aspects of soil science related to the quantity and/or quality of goods and services in the management of resources of nonagricultural lands, and the impact of managment practices on environmental quality. These include soil moisture, soil temperature, and nutrient element status interrelationships in the evaluation of soil productivity; evaluation of ecosystems to quantify nutrient element balances and cycling; amelioration of soils for increased productivity; and impact of various land-use practices on soil productivity.

Modern well-equipped laboratories are available for graduate student use in plant, soil, and water chemical analyses; soil water-holding capacity and compaction; infiltration and runoff; and other chemical and physical property investigations. The extensive College properties noted previously permit forest soil research to be conducted under a wide variety of environments and ecological conditions.

Programs are coordinated with other areas of specialization through cooperation among school personnel, with other departments of the College, Syracuse University, and the U.S. Forest Service.

TREE IMPROVEMENT

Tree improvement has become an important component of intensive forestry practice. Its main objective is to breed for commercial distribution varieties of trees that are well adapted to such specified conditions as management objectives, cultural practices, and physical and biological site factors. As a specialized study area, it draws upon such fields as genetics, plant biochemistry and physiology, and statistics.

FOREST INFLUENCES

Forest influences as an area of graduate study includes all the effects resulting from the presence of forest trees and associated vegetation on climate, the hydrologic cycle, erosion, floods, and soil productivity. Health considerations and human comfort have often been included in older definitions of forest influences, and are assuming greater importance today with our growing concern for the environment.

Included among the principal studies in this area are energy exchange between forest and atmospheres; moderation of urban environments by vegetation; soil and slope stability; and watershed hydrology, including snow.

Graduates fill a variety of positions in research, teaching, and public and private management as watershed management specialists, hydrologists, environmental officers, meteorologists, and ecologists.

INTERNATIONAL FORESTRY CONCENTRATION

Graduate education in international forestry as an area of emphasis is available to students under both the Forest Resource Management and Policy, and Silviculture and Forest Influences programs and is designed to assist individuals who are intent upon pursuing internationally-oriented careers in forestry and related fields.

Instruction is aimed at supplementing and enriching the student's technical forestry knowledge and providing the broad background deemed necessary for effective service in a variety of professional areas. These include forestry advisor, teacher, or research specialist with national and international agencies, private business and industrial firms, philanthropic foundations, and voluntary service organizations whose activities include the development and use of forest resources in other lands.

At the master's level, program emphasis is on the attainment of general competence in research methods, foreign languages, cultural anthropology, world geography, and international affairs, plus a broad understanding of the world forestry situation. At the doctoral level, program concentration is on a specialized discipline area such as forestry economics, forest policy and administration, forest management, or silviculture. Orientation to the world forestry field is achieved in part through the selection of formal coursework, and in part through providing an opportunity for the student to conduct his thesis research in residence abroad.

A wide variety of course offerings are available to support the nonforestry elements of this area of study through Syracuse University. Opportunity for field training and research in tropical forestry and related fields is available to qualified candidates, especially at the doctoral level, under cooperative agreements maintained by the College with the Institute of Tropical Forestry in Puerto Rico and the University of the Andes, Merida, Venezuela.

URBAN FORESTRY CONCENTRATION

Graduate study in urban forestry allows the student to pursue either of two broad objectives. Professional Urban Forestry skills may be broadened in the many areas of information important to the practice of forestry in urban and urbanizing areas through advanced coursework and applied research. More specialized study may be pursued in scientific disciplines supporting the practice of urban forestry. Active areas of specialized research and study in the School includes soils, greenspace ecology, atmospheric science, tree

improvement, forest resource inventory and evaluation, and resource economics and planning. There is strong interaction with other urban-related areas of study within the College, including remote sensing, botany, pathology, entomology, and wildlife ecology. Academic departments in the Maxwell School of Public Affairs at Syracuse University such as Geography, Economics, Political Science and Sociology, cooperate with teaching and research programs in urban forestry. The U.S. Forest Service, Northeastern Forest Experiment Station, maintains a permanent staff of scientists in their Urban Forest Research Project on campus who are engaged in studies dealing with the planning and management of urban forest ecosystems. This work complements the College's participation as one of nine universities in the Consortium for Environmental Forestry Studies, an organization of scientists and graduate students studying a wide range of problems in urban forestry.

THE SCHOOL OF FOREST TECHNOLOGY

JAMES E. COUFAL, *Director* (Silviculture, Entomology, Pathology, and Personnel Management)

LUNK (Wildlife Ecology, Graphics, Silviculture, and Recreation), MARTIN (Mensuration, Statistics, Wildlife Ecology, Tree Physiology and Morphology), MILLER (Forest Roads, Installations, Recreation, and Policy), REMELE (Ecology, Silvics and Silviculture, Forest Management, and Aerial Photogrammetry), STERBENZ (Surveying, Graphics, Computer Science, and Remote Sensing), SUHR (Water Resource Management, Dendrology, Entomology, and Aerial Photogrammetry).

FOREST TECHNICIAN PROGRAM

In 1912, some 1,800 acres of land in the Adirondack Mountains were donated to the College as a site for the development of a Ranger School. Since that time, the forest technician program has trained more than 2,800 graduates, most of whom are now working in a variety of forest activities, and it has earned the School a national reputation for excellence.

The two-year curriculum trains students as forest technicians. The degree of Associate of Applied Science in Forest Technology (A.A.S.) is awarded. The objectives of the curriculum are to provide students with a knowledge of the field practices of forestry as related to forestry managerial needs; the ability to work and communicate effectively with professional and paraprofessional forestry personnel; and an understanding of the sciences and practices of forestry with some emphasis on ecological applications.

Graduates are generally classified as forest technicians or forestry aides in initial employment positions. Forestry agencies and wood-using industries employ forest technicians as an important part of their forest management teams, usually as the "people on the ground" who plan and execute the field practice of forestry normally under the supervision of a professional forester.

Since the curriculum is a terminal, two-year program at the paraprofessional level, students interested in a professional degree in forestry should investigate enrollment directly in one of the College's undergraduate programs. Transfer into some of these programs is possible upon completion of the A.A.S. degree. Further, while there is a real value and need for forest technician training at the A.A.S. level, a concept fully backed by the total College, graduates must appreciate the fact that they are not considered professional foresters upon completion of the A.A.S.

The freshman year forest technology curriculum consists of general studies courses which may be taken at any accredited four-year college, community or junior college, or agricultural and technical institute.

The second year of the curriculum is offered at the College's School of Forest Technology on the Wanakena Campus. Presented in a varied forest environment, the curriculum's emphasis is on applied field training and on the relationships between forest technology and managerial needs. Fifty percent of the studies are devoted to field exercises, most of which are held in the School's forest. This managed forest, containing both hardwood and coniferous species, covers an area some 3½ miles long with widths varying from 6/10ths of a mile to 2¼ miles. On two sides, the forest is bounded by State Forest Preserve lands. The forest is also adjacent to an area of several square miles of virgin timber within the Adirondack Forest Preserve. This excellent forest backdrop for the technology program provides a diverse laboratory for instructional purposes.

Since the School is situated within a forest environment, some applicants to the forest technology program may mistakenly believe that the program is one of forest lore and wilderness survival. It is, therefore, strongly emphasized that the forest technology curriculum demands high quality academic achievement. Students cannot complete the program without concentrated and consistent study. Classes are scheduled from 8 a.m. to 5 p.m., Monday through Friday, with classroom and laboratory or field time equally divided. The intensity of the program normally requires a minimum of 70 hours a week of evening and weekend study, daily classes, and laboratory/field exercises. Several short trips, at no additional expense to the student, are made during the year in connection with courses in logging, forest recreation, forest mensuration and silviculture. A longer trip of seven days' duration emphasizing regional forestry practice is sponsored during the spring semester of the second year. Students must bear their proportionate share of the cost of this field trip which consists primarily of air fare, lodging and meal expenses.

LIFE AT WANAKENA

The Wanakena Campus of the College of Environmental Science and Forestry is located on the banks of the Oswegatchie River near the picturesque hamlet of Wanakena, approximately 65 miles northeast of Watertown, and 35 miles west of Tupper Lake. The School's buildings and its surrounding forest border on the river which flows directly into Cranberry Lake.

The main School building consists of a central service unit with dormitory wings on either side. The central unit contains classrooms, laboratories, a student lounge, faculty offices, the library, a kitchen, dining room and 47 student rooms, each housing two students.

Faculty living quarters are nearby on the campus. Other buildings include a maintenance shop, garages, a sugar house, and storage buildings.

The close proximity of faculty offices and student quarters and the intensive field-work pattern enables students to consult easily and frequently with the faculty. The School considers this traditional close student-faculty association to be of major benefit in its training program.

A small library of approximately 1,500 volumes consists of highly specialized materials required for the teaching and study programs of the School.

Students taking the second year of the forest technology curriculum at the Wanakena Campus are required to live in the School's dormitories. An exception may be made for married students who bring their families and rent their own private accommodations in the vicinity. Such accommodations are not plentiful. Each married student should make rental arrangements well in advance of the registration date.

The Wanakena Campus does not maintain an infirmary, nor does it employ a physician or nurse. There are two excellent physicians and a dentist as well as an excellent Community Hospital in nearby Star Lake, New York. In emergency situations, the School transports sick or injured students to the local physician of their choice or to the hospital. A student accident or sickness insurance plan is available through the Wanakena Campus, and it is strongly suggested that the student consider such coverage before reporting to the Campus.

Because of the comparatively isolated location of the Wanakena Campus, a stock of books and supplies used in connection with the second year of the program is maintained on campus for sale to students.

During the first year of the program, College-enrolled students will be guided by the rules and regulations that govern attendance at their local campus. During the second year of the program, students will be guided by the general rules and regulations for College of Environmental Science and Forestry students and an additional set of Wanakena Campus "house rules."

ADMISSION

Admission Requirements

Requirements for entrance into the forest technology curriculum require a minimum of high school units consisting of: English; history (social science); science (including biology); mathematics (including trigonometry or Math 11); and electives. Mechanical drawing is a suggested elective.

In addition to the academic requirements, the following must also be met by all applicants:

1. The applicant must be strongly motivated toward a career as a forest technician.
2. The applicant must be willing and able to meet the physical requirements of the program which include pole and tree climbing, walking 2 to 6 miles through forest areas often carrying 15-20 pounds of equipment, and using a wide array of hand tools and power equipment.
3. The applicant's parents (if the applicant is under 18 years of age) must be fully aware of the field nature of the study program, its rigorous study-work regime and supporting academic facilities.
4. A full medical examination report must be submitted.

Questions concerning any of these requirements should be referred to the Director of Admissions who may, under special circumstances, waive some of them.

Admission Procedures

The decision to admit any student to the Forest Technician Program rests solely with the College of Environmental Science and Forestry. Most openings in the program are filled by students who received conditional acceptances while still seniors in high school, contingent on successful completion of the first year of college. Remaining openings are filled by transfer students who have already attended college. Therefore, it is suggested that the potential forest technician student apply while still a high school senior.

Here is the procedure:

1. Seniors in high school must submit a regular SUNY freshman application for the College of Environmental Science and Forestry, using a Curriculum Code 620 (Forest Technology). These applicants should indicate entry date to be one year in advance of the current year.
2. Submit a regular application to that school selected for the first year of study, using Curriculum Code 620. It is important that students gain entry on their own for the first year of studies. The College will request information at a later date concerning what institution the student will be attending.

Transfer Students

Students with previous college experience, or students who are currently enrolled at another college, may apply for transfer. However, courses transferred for credit can be applied only to the freshman year course of studies, and they must be appropriate to those courses and comparable in subject matter, content, and level. All second year courses must be taken at the Wanakena Campus and, therefore, a student cannot transfer any previously earned credit toward the second year. Transfer applicants must submit a recent official copy of their college transcript and a list of courses they anticipate completing prior to enrollment.

EXPENSES

Cost of the first year will vary with the specific institution attended.

Estimated costs of the second-year program on the Wanakena Campus are as follows:

	Tuition	*Board & Room*	*Books & Supplies*
New York Resident	$1,900	Approx. $1,600	Approx. $375
Nonresident	$1,500	Approx. $1,600	Approx. $375

An additional estimated expense of $150 will likely be incurred to cover the cost of laundry and clothing. The cost of the seven-day regional forestry practice trip during the spring semester is estimated at approximately $200. There is also a $20 graduation fee and a $10 student activity fee, plus a $50 residence deposit and a $25 equipment deposit. The latter two fees are fully or partially refundable, depending on breakage charged to a student during the year.

FOREST TECHNOLOGY CURRICULUM
(Associate of Applied Science Degree)

Freshman Year *Credit Hours*

(Completed at a college of the student's choice)

[1]General Biology	8
English	6
[2]Math	6
Economics	3
[3]Electives	7
	30

[1]Courses selected may be in general biology, but at least one course in introductory botany is preferred.
[2]Competency in plane trigonometry and college algebra is required. If demonstrated, credits become electives. If a student feels transfer to a baccalaureate program is a possibility, he would be well advised to take calculus.
[3]*If* a student feels transfer to a baccalaureate program is a possibility, general chemistry and/or physics would be most appropriate electives.

Senior Year
(Wanakena Campus)

First Semester	FTC 200	Dendrology I	2
	FTC 202	Plane Surveying I	4
	FTC 204	Forest Mensuration and Statistics I	3½
	FTC 206	Forest Ecology	3
	FTC 207	Aerial Photogrammetry	2
	FTC 208	Forest Installations	3
	FTC 213	Forest Protection I	2
	FTC 223	Graphics	1
			20½
Second Semester	FTC 203	Plane Surveying II	3
	FTC 205	Forest Mensuration and Statistics II	2
	FTC 209	Forest Roads	2
	FTC 211	Silviculture	2½
	FTC 212	General Forestry	1
	FTC 214	Personnel Management	1½
	FTC 215	Timber Harvesting	2
	FTC 217	Forest Management	2½
	FTC 218	Forest Recreation	1½
	FTC 219	Elements of Wildlife Ecology	1½
	FTC 221	Water Resource Management	2
	FTC 225	Regional Forestry Practices	1
	FTC 227	Forest Protection II	2
	FTC 228	Structure and Growth of Trees	1
			25½

A total of 76 credit hours is required. Upon satisfactory completion, an Associate of Applied Science (A.A.S.) degree in Forest Technology will be awarded.

FINANCIAL ASSISTANCE

Financial aid is available upon acceptance to the College of Environmental Science and Forestry. There are three basic loans, scholarships or grants, and part-time employment.

More detailed information on these financial aid opportunities can be found on pages 32-36 of this catalog and the publication *Financial Assistance at ESF*.

The student must file an application with the Office of Financial Aid at the Syracuse Campus and submit a *Financial Aid Form* to the College Scholarship Service, Princeton, New Jersey 08540.

PLACEMENT

The School assists in placement of graduates. The reputation of the College's Forest Technology School usually results in graduates being readily able to find employment. Employment is common with local, state and federal forestry, and land resource agencies, private forestry enterprises, and surveying firms. Positions most frequently filled by recent graduates include: state forest ranger, state forest technician, forest aide, industrial forest district supervisor, timber inventory specialist, timber sales supervisor, forest surveyor, forest engineering aide, forest protection technician, forest research technician, and forest equipment salesman.

THE SCHOOL OF LANDSCAPE ARCHITECTURE

ROBERT G. REIMANN, *Dean*

FACULTY

GEORGE W. CURRY. *Professional Experience*: The Reimann-Buechner Partnership, Landscape Architects, Syracuse; The Curry-Paulo Partnership; Member, Syracuse Commission for the Conservation for the Environment and Syracuse Landmark Preservation Board. Licensed Landscape Architect, New York State. *Fields of Specialization*: Site Planning, Urban Analysis and Design.

GEORGE F. EARLE. *Professional Experience*: School of Architecture, Syracuse University; Artist; President, World Affairs Council. *Fields of Specialization*: History of Art, Cultural History; Painting, Latin American Art; History of Landscape Architecture; Design; Pre-Colombian Art.

JOHN P. FELLEMAN. *Professional Experience*: Planning Engineer, Monroe County, N.Y.; Urban Planner, NYS Hudson River Valley Commission; Chief Planner, Bruce Howlett, Inc.; Licensed Professional Engineer, New York State; Designated Planner-in-Charge, New York State. *Fields of Specialization*: Site Systems Engineering; Route Location; Public Works Administration; Resource Data Banks.

CLAUDE C. FREEMAN. *Professional Experience*: Russell Bailey and Associates, landscape architects and planners; Alfred Obrist, Landscape Architect and Civil Engineer. *Fields of Specialization*: Site Design, Plant Materials, Graphics.

DAVID B. HARPER. *Professional Experience*: Teaching intern, Boston Museum of Science; American Friends Service Committee, Mexico and Algeria; Teacher/Director, Franconia College, New Hampshire; Regional Archaeological Survey in Greece, University of Pennsylvania; Natural Resources Planner, Central New York Regional Planning and Development Board, Syracuse. *Fields of Specialization*: Regional Environmental Planning; Visual Quality Assessment; Archaeological Environmental Analysis.

RICHARD S. HAWKS. *Professional Experience*: EDAW, Inc., Cambridge Research Institute. *Fields of Specialization*: Regional Planning and Design, Facility Siting and Routing, Geographic Digital Data Banks.

ALLEN R. LEWIS. *Professional Experience*: Bucks County Planning Commission, Pennsylvania. *Fields of Specialization*: City and Regional Planning; Gaming and Simulation; System Dynamics.

FRANK L. MARAVIGLIA. *Professional Experience*: High school graphics and industrial arts; permanent certificates as Secondary Principal, Supervisor of Industrial Arts; Teacher of Industrial Arts, New York State; (Instructor) Creative Problem Solving, Syracuse University, and

SUNY Buffalo. *Fields of Specialization*: Technical Graphics; Creative Problem Solving; Communication.

THOMAS A. PAULO. *Professional Experience*: Cowin & Kilcommins, Attorneys at Law. Licensed Attorney State of New York; The Reimann-Buechner Partnership, Landscape Architects, The Curry-Paulo Partnership. *Fields of Specialization*: Law; Basic Design; Site Analysis and Design.

PATRICIA BARON POLLAK. *Professional Experience*: Research Assistant, Syracuse University; Syracuse Hill Urban Renewal Advisory Committee; Executive Board Chairperson, Metrodesign Associates, Syracuse; Housing Subcommittee, Community Development Advisory Committee, Syracuse. *Fields of Specialization*: Urban Planning, Human Behavior and the Designed Environment.

ROBERT G. REIMANN. *Professional Experience*: Landscape Architect, Pedersen, Hueber, Hares and Glavin; Sargent, Webster, Crenshaw & Folley, Architects, Engineers, and Planners; City of Montreal, Landscape Architect, Parks and Playgrounds; The Reimann-Buechner Partnership, Landscape Architects, independent practice. Licensed Landscape Architect, State of New York. *Fields of Specialization*: Methods and Philosophy of Design.

Introduction

The alteration of the physical environment has been a product of human activity since the earliest times of human settlement. While environments of enduring beauty and vitality occasionally resulted, the history of environmental manipulation more often demonstrated degradation and abuse of the landscape. As the knowledge of natural and human processes has expanded, the scope of environmental design has been transformed over the centuries from the casual efforts of many to that requiring skilled individual effort and often demanding multidisciplinary inputs in response to rapid change.

The School of Landscape Architecture offers curricula designed to educate students to contribute in varied ways to the wise use of land and landscape. Each degree program provides a basis for students to establish career directions in landscape architecture or in related disciplines. These curricula are offered at both the undergraduate and graduate levels.

Undergraduate Program

The School of Landscape Architecture offers two undergraduate degrees—the bachelor of science with a major in environmental studies (B.S.) and the Bachelor of Landscape Architecture (B.L.A.).

Both degrees share the ultimate purpose of providing senior level education for those concerned with the condition and form of the physical environment. The B.L.A. degree is accredited by the American Society of Landscape Architects (ASLA) as the first professional degree. The B.S. degree is granted at the end of four years of study and requires successful completion of 127 credit hours in a prescribed curriculum. The B.L.A. degree is granted at the end of five years of study and requires the successful completion of 160 credit hours in a prescribed curriculum.

BACHELOR OF SCIENCE IN ENVIRONMENTAL STUDIES

The B.S. degree with a major in environmental studies requires study in a core of courses. These provide a basic academic exposure to subject matter dealing with the environmental systems and processes, human manipulation of land, and visual quality of the environment. The degree offers each student an opportunity to concentrate in environmental land planning studies and is intended to respond to individual student's needs while adhering to standards of academic vigor and excellence. The objective of the degree is to provide knowledge in basic principles governing the evolution, operation, and vital processes of the physical environment. Graduate study in specific areas of interest is intended to follow successful completion of the degree. The complexity and scope of coursework required by the B.S. degree demands both discipline and commitment from students seeking the degree. Students receiving a B.S. degree have pursued graduate study in the disciplines of planning, architecture, landscape architecture, environmental education, and environmental law.

BACHELOR OF LANDSCAPE ARCHITECTURE

The B.L.A. degree is a professional degree with an emphasis on the skills and knowledge required to qualify as a landscape architect. The degree program consists of a core of courses involving the basic principles of landscape architecture design, land manipulation, and engineering, applied ecology, and communications. The major objective of the B.L.A. program is the development of basic proficiency in design, engineering, and communication skills necessary for formal admission into the profession of landscape architecture.

Where desired and when the prerequisite period of work experience has been completed, a person holding a B.L.A. degree may obtain a license to practice landscape architecture. At present, the State of New York requires those holding a B.L.A. degree to complete a three-year period of internship in the field prior to applying for the licensing examination. Other states have varying requirements for obtaining a license.

As in any area of professional study, students seeking the B.L.A. degree are expected to demonstrate a high level of commitment and scholarship in their studies. This commitment is demonstrated by a desire to serve society in an objective, rational, and ethical manner in designing the form of the environment.

Students receiving a B.L.A. degree have entered the profession as employees in public agencies or in private offices offering landscape architectural services. Also, B.L.A. graduates have entered graduate schools in landscape architecture, planning, urban design, regional design, and specific specialties including historic preservation, energy conservation, environmental policy management and research.

Graduate Program

MASTER OF LANDSCAPE ARCHITECTURE

The master's degree is offered to those students who hold an undergraduate degree and meet the prerequisites for admission. The two-year course of study at the master's level builds upon a student's understanding of design theory and process while emphasizing mastery of the skills associated with these. The core curricula focus on processes of community and urban environmental design. Students are required to integrate the required core of coursework with an elected area of concentration in the social or natural sciences. The program requires cross-disciplinary study to prepare students to enter a variety of positions not traditionally held by landscape architects. Illustration of these positions may be found in design research, community development, impact analysis, and environmental management. Although these positions require an understanding of design, they do not demand the traditional skills normally associated with project design. However, skills in management, analysis techniques, technological application, and the social and natural sciences are considered necessary to undertake these and other similar positions. Graduates of the program are currently employed by government, educational institutions and private offices practicing landscape architecture across a broad and comprehensive scope or purview. The M.L.A. degree is granted upon the completion of 48 credit hours in a prescribed curriculum.

For study beyond the M.L.A., the College's interdisciplinary Graduate Program in Environmental Science offers the opportunity for M.L.A. students to pursue a Ph.D. degree. This degree is appropriate for those seeking a career in teaching and research. Programs and degree requirements are individually arranged to integrate environmental design with one or more of the other disciplines represented at the College.

Prerequisites for entry into the B.S. and B.L.A. degree programs:

Lower Division Courses

Course Area	*Credit Hours*
Written and Oral Communication	6
Required credit hours in this area should be taken in courses dealing with English comprehension, the basic skills of grammar and composition, and public speaking.	
Graphics	3
A minimum of one semester's work preferably in a course in engineering drawing but mechanical drawing and/or architectural drafting may be selected.	
Natural Sciences	6
Required credit hours in this area must include a course in botany or plant biology. Additional hours should be taken from coursework in ecology, physical geography, earth science, geology, or environmental geology.	
Social Sciences	3
Required credit hours in this area are to be taken from coursework in U.S. history, sociology, social psychology, social or cultural anthropology, political science, or economics.	
Analytical Tools	6
Required coverage of college algebra and trigonometry. Students with prior coverage in math who can demonstrate proficiency at time of admission may substitute elective hours for this prerequisite. More advanced math is desirable but not required.	

Beyond the scope of subjects and credits required on a prerequisite basis, students planning to transfer to the School of Landscape Architecture should consider the following as highly desirable in their preparatory coursework. Courses marked (*) will be required following transfer, if not completed during the first two years.

Written and Oral Communication	6
Natural Sciences	3
Social Sciences	3
Analytical Tools	3
*Elementary Plane Surveying and Air Photo Interpretation	2
*Introduction to Computers	2
(This course should include introduction to programming utilizing BASIC, FORTRAN, or APL.)	
Art/Design	3
Study in this category should preferably include a course in art history or studio art, dealing with three-dimensional design, i.e., sculpture, ceramics.	
Electives	19
TOTAL MINIMUM LOWER DIVISION CREDITS	62

Junior Core Year

The B.S. and the B.L.A. degrees share a common junior or third year curriculum with the purpose of developing a basic knowledge of environmental systems, physical geography of land, visual awareness and understanding of landforms, design principles and form and communication skills. At the conclusion of the third year, each student is asked to select either a B.S. or B.L.A. degree option. This selection is made with a faculty advisor after a complete evaluation of individual career goals and program opportunities.

Junior Year			*Credit Hours*
First Semester	LSA 320	Introduction to Landscape Architecture and Planning	3
	LSA 326	Landscape Architectural Design Studio I	3
	GRA 382	Graphic Communication	2
	FBO 320	Ecology or Elective	3
	MAT 185	Introduction to Computer	3
	ERE 370	Elementary Surveying and Air Photo Interpretation	2
	LIB 300	Library Research	1
			17
Second Semester	LSA 327	Landscape Architectural Design Studio II	3
	LSA 490	Social Behavior and the Designed Environment	3
	EIN 371	History of American Landscape Attitudes	3
	LSA 345	Elements of Site Engineering	3
	EIN 311	General Geography	3
	NAS 095	Technical Writing	2
			17

BACHELOR OF SCIENCE WITH A MAJOR IN ENVIRONMENTAL STUDIES

Senior Year

Of the total 31 credit hours required during the senior year, 15 credit hours must be taken from the School of Landscape Architecture course offerings. The other 16 credit hours must be taken from the following two general areas:

1. The elements of human settlements and their interrelationship. These electives are usually chosen from courses in history, economics, political, and social sciences.
2. The influences on environmental land planning. These electives are usually chosen from courses in resources management, geology, law and public policy, geography.

The specifics of an individual student's senior year are developed by the student and the faculty advisor based on the student's goals and subject to recommendation by the School's faculty.

B.L.A. SENIOR AND FIFTH YEAR

Senior Year			*Credit Hours*
First Semester	LSA 422	Landscape Design Studio III	4
	LSA 432	Plant Materials Culture	1
	LSA 440	Site Development Systems	3
	LSA 496	Plant Materials	1
	EIN 451	Fundamentals of City and Regional Planning	3
	EIN 471	History of Landscape Architecture	3
	FEN 432	Insects and Site Planning	1
			16
Second Semester	LSA 423	Landscape Design Studio IV	4
	LSA 425	Orientation for Experiential Studio	3
	LSA 547	Principles of Professional Practice	2
	EIN 470	Art History or Elective	3
	Elective		3
			15

FIFTH YEAR

Summer	LSA 533	Plant Materials	3
			3
First Semester	LSA 524	Experiential Landscape Design Studio V (Off-Campus Location)	16
			16
Second Semester	LSA 522	Landscape Design Studio VI—Urban Design	4
	or		
	LSA 525	Landscape Design Studio VI—Site Design	4
	or		
	LSA 527	Landscape Design Studio VI—Regional Design	4
	LSA 545	Professional Practice Studio	2
	ARC 594	Architecture for Landscape Architects	3
	Elective		3
	Elective		2
			14

NOTE: A number of the courses listed for the B.S. and B.L.A. programs are in the process of being revised. Upon revision, new course descriptions will be available after approval by the College of Environmental Science and Forestry Faculty.

M.L.A. DEGREE PROGRAM

The M.L.A. curriculum has three components; a sequence of required core courses; a series of elected courses in an area of concentration; and a project or thesis. The required core courses have as their focus the development, enhancement, and refinement of understanding of landscape architectural philosophy, theory, skills, and techniques, as focused on community and urban environments. Emphasis is placed on the refinement of proficiency in design research skills, concepts, and objectives.

Each student is required to select and complete a group of courses in an area of concentration in one of two design-related areas. These areas are in social/behavior studies and natural/physical applied sciences. Selection of an area of concentration is the responsibility of each student assisted by a faculty advisor.

Every student is required to prepare a terminal project or thesis which is reviewed by a committee of faculty. A project consists of the application of professional knowledge and skills to a landscape architectural problem in order to develop a solution. A thesis consists of research which expands or clarifies either basic knowledge of landscape architecture or knowledge related in some way to the expanding scope of landscape architecture.

In general, the following describes the broad sequential purposes of the four-semester program:

First Year, Fall Semester: The first semester of study is intended to provide an introduction to concepts and design processes in emerging areas of community and urban environmental design. An examination of the impact of socio-cultural factors on the environment is provided.

First Year, Spring Semester: The second semester of study is intended to investigate design through a variety of projects focusing on the form and condition of environments supporting human behavior. Methods of research and analysis relevant to natural and social determinants are introduced.

Second Year, Fall Semester: The third semester of study is intended to investigate the potential interrelationship between natural systems and design. Through a systems modeling project, students investigate the tolerances of natural systems and their responsiveness to alteration.

Second Year, Spring Semester: The final semester of study consists of intensive work on a project or thesis, as well as continued study in the selected area of concentration. It is anticipated that the project/thesis consists of a study examining an aspect of the area of concentration and its relationship to landscape architecture.

Research plays a significant role in the graduate program, primarily through funded projects and projects/thesis. Not only does research provide new knowledge and applications for the profession, but it enriches the curriculum, enhances faculty expertise and develops student skills in rigorous observation, clear thinking and lucid writing.

By the nature of a profession which exists on shifting frontiers of human interaction with natural and built environments, much of the research in landscape architecture deals with issues in an exploratory way. Faculty members and graduate students usually work together on research projects in an atmosphere of mutual learning. Approaches may vary from rigorously quantitative analysis of data to highly qualitative evaluation of broad problems to application of design and planning methods to specific cases.

The College library and the several libraries on the Syracuse University campus offer reference material to support study programs. Facilities at the School are extensive. They include adequate studio and office space as well as reproduction, model making, photographic and audio-visual equipment. The College's Computer Center is fully interfaced with Syracuse University to provide a complete range of academic and research capabilities. The College also has a fully-equipped video tape recording (VTR) studio and photogrammetric labs.

The School is unique in its location within the College of Environmental Science and Forestry. This situation provides the M.L.A. candidate with the opportunity to draw upon information and knowledge in ecology, natural sciences, resource management, forestry and many other related environmental disciplines. The U.S. Forest Service Urban Forestry unit located at the College provides a unique opportunity to promote interdisciplinary environmental design research. In addition, the relationship with Syracuse University provides the School with an extensive intellectual as well as physical resource basis.

The Syracuse area has the largest concentration of landscape architectural firms in the state, outside New York City. With a metropolitan population of nearly 500,000, the city has many opportunities for urban-oriented study. Also, the city's central location in Upstate New York provides easy access to a rich variety of public lands and recreation areas which are planned and administered by a diverse range of governmental agencies and private owners.

Students seeking admission to the M.L.A. program must complete the following prerequisites prior to beginning the graduate studio core sequence.

1. Coursework. A student may elect to take these courses at the School of Landscape Architecture or at another school. If a course is taken at another school, however, it is important that a student ascertain that the content described below is provided. The prerequisites will be met on this campus by taking a prescribed set of undergraduate and graduate courses.

   Design: two applied studio courses which examine landscape architectural design theory and process through application to specific projects.

   Landform: one course which examines the types of landforms that exist in nature and which surveys the adaptation and manipulation of these for new uses.

Basic Ecology: one course which examines the basic scientific principles of natural systems.

Basic Computers: one course which introduces students to use of computers, including programming.

Social Sciences: two courses which introduce students to the scientific study of an aspect of human behavior (e.g., sociology, anthropology, psychology).

Natural Sciences: two courses which introduce students to the scientific study of an aspect of the natural sciences (e.g., biology, botany, geology, dendrology).

2. An undergraduate degree.
3. Graduate Record Examination scores.
4. Undergraduate transcript.
5. Three letters of recommendation.
6. Design portfolio for those applicants who have completed the design prerequisites.
7. A written statement of the purpose and goals of seeking a Master of Landscape Architecture in the field of community and urban environmental design.
8. TOEFL scores for those applicants whose native language is not English.

Applications should be made to the College prior to March 1; letters of acceptance from the School are mailed out to the applicant prior to mid-April.

M.L.A. Program Sequence

The M.L.A. program is established as a two-year sequence of courses. The following sequence illustrates a typical two-year program.

First Year

Fall

		Credit Hours
LSA 697	Seminar—Topics and Issues of Landscape Architecture	2
LSA 620	Studio 1	4
LSA 650	Determinants of Urban/Regional Land Use	3
Elective		3
		12

Spring

LSA 699	Research Methods and Techniques	3
LSA 720	Studio II	4
LSA 653	Environmental Land Use Planning	3
Elective		2
		12

Second Year		*Credit Hours*
Fall		
LSA 899	Project/Thesis	2
LSA 721	Studio III	4
Electives		6
		12
Spring		
LSA 899	Project/Thesis	12 or 6
Electives		6
		12

Graduate Exchange Programs

INTERCAMPUS DOCTORAL EXCHANGE

There is an opportunity for doctoral students at ESF to study for one or two semesters at the following schools: State University Centers at Albany, Binghamton, Buffalo, or Stony Brook; City University of New York; or New York University.

This exchange program provides students with an opportunity to take advantage of over 160 faculty, specialized research laboratories and equipment, technical libraries, and field study areas which complement the extensive programs and resources at ESF which are discussed throughout this catalog.

This fellowship provides a grant-in-aid of up to $5,000 a year plus a tuition waiver. For further information, please contact the Office of Academic Programs.

COLLEGE OF AGRICULTURE AND LIFE SCIENCES AT CORNELL UNIVERSITY

The State University of New York College of Environmental Science and Forestry and the New York State College of Agriculture and Life Sciences at Cornell University provide an opportunity to exchange graduate students so they can take advantage of special courses, faculty, and research facilities.

There are a number of programs on both campuses which complement one another. The following research and instructional areas at the College of Agriculture and Life Sciences appear likely to be of greatest interest to ESF students.

Agricultural Economics—Land Economics; Resource Economics; Resource Investment and Environmental Quality; Agricultural Land Policy.

Agricultural Engineering—Physical Analysis of Plant and Animal Materials; Soil and Water Engineering; Environmental Systems Analysis; Drainage Engineering; Soil and Water Conservation.

Agronomy—Identification, Appraisal and Geography of Soils; Soil Fertility Management; Soil and Water Conservation; Aquatic Plant Management; Forest Soils; Soil Microbiology; Microbial Ecology; Use of Soil Information and Maps as Resource Inventories; Soil Organic Matter; Soil Chemistry; Weed Science; Dynamic Climatology; Physics of Clouds, Rain, and Rainmaking.

Natural Resources—Wildlife and Fisheries Management; Environmental Conservation; Resource Analysis and Planning; Woodland Management; Forest Ecology; Maple Syrup Production.

Floriculture—Woody Plant Materials; Herbaceous Plant Materials; Plants and Design.

Entomology—Insect Pest Management; Arthropod Pests of World Importance; Biological Control; Insect Pathology; Environmental Biology; Pesticides in the Environment.

Plant Breeding and Pathology—Plant Cell Genetics; Methods of Plant Breeding; Genetics and Breeding for Disease and Insect Resistance; Plant Pathology; Advanced Disease Control; Dendropathology; Pest Management for Plant Protection; Advanced Mycology; Plant Virology; Plant Nematology; Bacterial Plant Pathogens; Disease Physiology; Philosophy of Plant Pathology; Taxonomy of Fungi; Pathology of Trees and Shrubs.

Pomology—Tree Fruits; Orchard Management; Growth and Development of Woody Plants.

Rural Sociology—Rural Development and Cultural Change; Political Structure and Development; Social Power and Community Change; Political Economy of Rural and Regional Development.

For detailed information please contact the Office of Academic Programs.

Course Offerings

Students at the College of Environmental Science and Forestry have not only the academic and research resources of their own institution, but also the resources of nearby Syracuse University and State University Upstate Medical Center.

COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY COURSE DESCRIPTIONS

The courses offered by the College are grouped by general subject areas, and the number of credit hours appears after the course title. A credit hour means one recitation (or lecture) hour per week. Three laboratory hours are equivalent to one lecture hour.

The semester and year after each course indicates when it will next be offered. The College reserves the right to alter the scheduled offering of a course when its enrollment is too small, or when there is no qualified faculty member available to teach it.

Course Numbering System

Code Levels:

100-299 Lower-division undergraduate courses for which no graduate credit may be given.

300-499 Upper-division undergraduate courses for which no graduate credit may be given.

500-599 Graduate courses designed expressly for areas of specialization in post-baccalaureate programs or in the professional program leading to the Bachelor of Landscape Architecture. Undergraduate students with superior academic records may register for these courses.

600-699 Graduate courses which permit undergraduate students to enroll only by petition with a well-documented justification approved by the undergraduate advisor, curriculum director, and course instructor.

700-999 Graduate courses for which no undergraduate may enroll.

FBL—BIOLOGY (FOREST BIOLOGY)

303. Introductory Environmental Microbiology **(3)**
Two hours of lecture and three hours of laboratory. An introduction to the biology of microorganisms and viruses and a study of their interactions with other microbes and macroorganisms. Fall, 1979.
Prerequisite: A year course in biology or equivalent.

320. General Ecology **(3)**
Two hours of lecture, three hours of field trips during the first half of the semester. Three hours of lecture during the second half of the semester. Introduction to ecosystem ecology stressing the dynamic interrelationships of plant and animal communities with their environments, ecological factors, energy flow and trophic levels in natural communities, plant responses and animal behavior, population dynamics, biogeography, and representative ecosystems. The ecological impact of man is reviewed. Fall, 1979.
Prerequisite: A year course in biology or equivalent.

330. Principles of General Physiology **(3)**
Three hours of lectures. Introduction to the dynamics of living systems with emphasis on the universality of the biological world. Spring, 1980.
Prerequisite: One semester of organic chemistry.

400. Forest Techniques for Biologists **(1)**
Full-time for one week. Cranberry Lake Biological Station. Techniques of forest stand inventory and measurements; mensurational analysis; stand manipulation, harvesting, regeneration, and protection. Summer, 1980.

405. History of Natural Science **(1)**
One hour of lecture. A review of the history of western science from pre-Ionian times to Darwin, with evaluation of the impact of culture and religion on scientific progress. Spring, 1980.

420. Field Experience—Internship **(5)**
Full-time for at least five weeks, or equivalent, of employment with an agency or professional involved in field activity. A resident faculty member is required to serve as course evaluator. Approval of curriculum director is necessary. See your advisor for detailed procedural information. Summer, 1980.

421. Ecology of Freshwaters **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. Experimental and observational studies of environmental and biotic interactions influencing productivity of freshwaters. Basic concepts at the organismic, population, and community level. Summer, 1980.

430. Fungal Physiology **(3)**
Three hours of lecture-discussion. Principles of growth, morphogenesis, and reproduction of the fungi emphasizing the role of the environment in controlling fungal processes. Spring, 1980.
Prerequisite: FBL 330 or equivalent.

431. Fungal Physiology Laboratory **(1)**
Three hours of laboratory. Selected experiments in the quantitative study of fungal growth, nutrition, sporulation, and spore germination. Spring, 1980.
Co-requisite: FBL 430.

470. Principles of Genetics **(3)**
Three hours of lecture and discussion. A general course covering concepts of genetics and evolution base to upper division biology and biochemistry courses. Includes the inheritance and analysis of Mendelian and quantitative traits, the chemical nature of the gene and its action, the genetic structure of populations and their evolution. Numerical methods for characterizing and analyzing genetic data are introduced. Spring, 1980.
Prerequisite: A one-year college introductory biology course.

471. Principles of Genetics Laboratory (1)
Three hours of autotutorial laboratory. Experiments with plants and animals and computer simulation exercises demonstrate the basic principles of inheritance of Mendelian and quantitative traits and changes in populations caused by major forces in evolution or by breeding procedures. Numerical methods for characterizing quantitative traits and for testing hypotheses are introduced. Spring, 1980.
Co-requisite: FBL 470 or equivalent.

472. Introduction to Quantitative and Population Genetics (1)
Ten lecture-discussions and four autotutorial laboratories the second half of the semester (incl. Lecture-Lab Modules 5 and 6 of FBL 470 and 471). Basic genetic concepts of quantitative inheritance, the structure of populations and evolution. Laboratory experiments and computer simulations are used to demonstrate these concepts. Numerical methods for characterizing and analyzing genetic data are introduced. Spring, 1980.
Prerequisite: An introductory genetic lecture-laboratory course deficient in these areas of genetics and permission of instructor.

496. Topics in Biology (1-3)
Experimental, interdisciplinary, or special coursework in biology for undergraduate students. Subject matter and method of presentation varies from semester to semester. May be repeated for additional credit. Fall or Spring, 1979-80.

497. Undergraduate Seminar (1)
Literature surveys and seminars on topics of biological interest and importance. Subject to be generated by faculty and students and to be announced prior to registration. Fall and Spring, 1979-80.

498. Research Problem in Biology (1-3)
Independent research in topics in Forest Biology for the superior undergraduate student. Selection of subject area determined by the student in conference with appropriate faculty member. Tutorial conferences, discussions and critiques scheduled as necessary. Final written report required for departmental record. Fall, Summer and/or Spring, 1979-80.
Prerequisite: Permission of instructor.

500. Forest Biology Field Trip (2)
A seven-to ten-day trip to (1) agencies engaged in biological research, management, and administration, or (2) regions or areas of unusual biological interest. A final report is required. Estimated student expense, $75. Fall or Spring, 1979-80.
Prerequisite: Permission of the instructor.

522. Population Ecology (3)
Two hours of lecture and three hours of laboratory per week. Description, analysis, evolution, interactions and stability of natural and experimental populations. Spring, 1980.
Prerequisite: FBL 320 or equivalent.

525. Limnology (3)
Three hours of lecture. An introduction to the physics, chemistry, and biology of inland waters, with particular emphasis on lakes. The course focuses on lakes as integrated ecosystems, and analyzes perturbations in this environment on the structure and function of the biological communities contained therein. Fall, 1979.
Prerequisites: An introductory course in physics, chemistry, and ecology.

526. Limnology Laboratory (1)
One laboratory or field trip/week. An introduction to limnology techniques and the procedures for empirically analyzing ecological relations in aquatic ecosystems. Field trips to local aquatic habitats. FBL 525 must be taken concurrently or previously. Fall, 1979.

540. Chemical Ecology **(3)**

Two hours of lecture and one hour of discussion. A treatment of biological phenomena incorporating elements of ecology, physiology, and chemistry as a basis for development, behavior, and survival. Emphasis is on the intra- and inter-specific relationships involving chemical messengers at the organismal, population, and community levels. Spring, 1980.

Prerequisites: Organic chemistry, general ecology, general physiology.

Note: FBL 540 is also listed as FCH 540.

635. Membranes and Biological Transport **(3)**

Two hours of lecture and one hour of discussion. Composition, structure, and physical properties of membranes. Membrane functions including transport, bioelectricity, and cell compartmentalization. Specific transport processes in biological systems. Fall (alternate years), 1980.

Prerequisites: One semester of biochemistry and an advanced physiology course, or permission of the instructor.

796. Topics in Biology **(1-3)**

A course offered by the faculty for students interested in biology. Check the Schedule of Courses for details. Fall and Spring, 1979-80.

997. Biology Seminar **(1)**

One hour of lecture-discussion per week. The course emphasizes current concepts and developments in biology. Fall and/or Spring, 1979-80.

FBO—BOTANY (FOREST BOTANY AND PATHOLOGY)

300. Structure and Function of Plants **(3)**

Two hours of lecture and three hours of laboratory work in the Autotutorial Learning Center. An introduction to plant biology with special emphasis on the structure and functions of the green plant. Fall, 1979.

Prerequisite: A year course in biology or equivalent.

310. Classification of the Plant Kingdom **(3)**

Two hours of lecture and three hours of lab. Introductory study of the plant kingdom with emphasis on the angiosperms. Spring, 1980.

315. Dendrology I **(3)**

Two hours of lecture and one three-hour laboratory/field trip each week. Field study, identification, natural history, and elementary silvics of important forest trees of North America. Fall, 1979.

330. Plant Nutrition **(3)**

Three hours of lectures. Descriptive aspects of the fundamental activities of plants. Subjects to be covered include cell structure, water and mineral metabolism, organic nutrition, and a brief introduction to biological control mechanisms. Will not satisfy the plant physiology requirement of botany majors. Fall, 1979.

Prerequisite: FBO 300 or equivalent.

360. Forest and Shade Tree Pathology **(3)**

Two hours of lecture and three hours of autotutorial laboratory. Major diseases of forest, shade, and ornamental trees and deterioration of forest products will be discussed with emphasis on disease identification, principles of disease development, effects of disease on the host and practical control measure. Spring, 1980.

415. Dendrology II **(1)**

One three-hour field trip/laboratory each week. A continuation of Dendrology I emphasizing trees and shrubs ecologically important in the Central New York region and economically important in North America. Fall, 1979.

417. Adirondack Flora (2)
Half-time for four weeks. Cranberry Lake Biological Station. Field study of the summer flora of the Adirondack Mountains. Summer, 1980.

422. Ecology of Forest Communities (2)
Half-time for four weeks. Cranberry Lake Biological Station. Study of the structural and functional characteristics of selected Adirondack forest ecosystems; techniques of vegetational analysis. Special requirement: students must be prepared to go on one over-night camping trip to an isolated study area. Summer, 1980.

425. Plant Ecology (3)
Two hours of lecture and discussion and one laboratory session per week. A first course in plant community ecology dealing with the dynamics of community development and change and the process of community analysis and description. Spring and Fall, 1980.
Prerequisite: FBL 320, or equivalent.

427. Bryoecology (2)
Half-time for four weeks. Cranberry Lake Biological Station. Study of the bryoflora of the major ecosystems of the Adirondack Mountain region. Summer, 1980.

428. Wetland Plant Ecology (1-2)
Full-time for one week. Cranberry Lake Biological Station. Study of wetland plant community dynamics and environmental relationships in the Adirondack Mountain Region. Summer, 1980.

432. Physiological Ecology of Plants (3)
Three hours of lecture. Examination of the interactions between plants and their environment. Emphasis will be given to the physiology of plants as it is modified by fluctuating external conditions and the mechanisms of plant adaptation. Students completing FBO 432 should not enroll in FBO 330. Spring, 1980.
Prerequisites: Introductory courses in physics, FBO 300, FBL 320, or permission of the instructor.

460. Field Problems in Forest Pathology (1)
Full-time for one week. Cranberry Lake Biological Station. Field study of important tree diseases in the Adirondacks, including heart-rots, root-rots, cankers, rusts, foliage diseases, mistletoe, and physiological diseases. Also field study of mycorrhizae and other tree-root mutualisms. Summer, 1980.

461. Principles of Forest Pathology (3)
The equivalent of three credit hours per week as lecture, discussion or laboratory. Concepts and principles of tree diseases in relation to forest practices and practical experience in disease diagnosis and impact evaluation. Fall, 1979.
Prerequisite: FBO 360 or permission of the instructor.

465. Field Mycology (2)
Half-time for four weeks. Cranberry Lake Biological Station. An introduction to the collection and identification of the Adirondack fungal flora. Field techniques and laboratory identification of the major fungi found in selected ecosystems. Summer, 1980.

490. Plant Propagation (1)
One combined lecture-demonstration-laboratory/week plus supervised greenhouse assignments. Instruction in principles and practices of plant propagation and in related greenhouse operations. Fall and Spring, 1979-80.
Prerequisite: Senior status in biology curriculum.

510. Mycology (5)
Three hours of lecture and six hours of laboratory. Fundamentals of the morphology, taxonomy, cytology, life histories, and ecology of fungi. Laboratory experience in culturing and identifying fungi. Fall, 1979.
Prerequisite: FBO 310 or FBO 360.

515. Systematic Botany **(3)**
Two hours of lecture and three hours of laboratory. Identification, nomenclature, and classification of flowering plants with special emphasis on local flora and on developing the ability to classify the plants of any region. Fall, 1979.
Prerequisites: FBO 300, FB 310 or permission of the instructor.

530. Plant Physiology **(3)**
Two hours of lecture. Internal processes and conditions in higher plants with emphasis on physiological and biochemical concepts. For students majoring in the biological sciences. Spring, 1980.
Prerequisites: FBO 300, FBL 330, or permission of the instructor.
Note: Botany majors electing this course for their concentration must also take FBO 531.

531. Plant Physiology Laboratory **(2)**
Two lab sessions. Introduction to current methods and procedures of physiological research including nutrition, tissue culture, photosynthesis, respiration, and hormonal regulation of growth. Spring, 1980.
Prerequisites: FBL 330, co-requisite FBO 530, or permission of the instructor.

562. Wood Microbiology **(3)**
Two hours of lecture and three hours of laboratory/field trip. Major types of fungus defects of wood and its products and principles of control. Special emphasis on chemistry of wood decay, wood durability, toxicants, lumber discolorations, heart-rots and decay in forest products. Fall, 1979.
Prerequisites: Organic chemistry, FBO 360, or permission of the instructor.

585. Plant Anatomy **(3)**
Two hours of lecture and three hours of laboratory. An introductory course in plant anatomy designed to familiarize the student with the organization and development of the primary and secondary plant body of higher plants. Spring, 1980.
Prerequisite: FBO 300.

625. Plant Ecology **(3)**
Two hours of lecture and discussion and one laboratory/discussion section per week. A first course in plant community ecology for beginning graduate students focusing on dynamics of community development and change and the processes of community analysis and description. Spring and Fall, 1980.
Prerequisite: FZO 320, or equivalent.

630. Fungus Physiology **(3)**
Two hours of lecture and one hour of discussion. Principles of growth, reproduction, and differentiation of the fungi emphasizing the role of the environment in controlling fungal processes. Spring (even years), 1980.
Prerequisite: Two semesters of physiology or biochemistry.

636. Photosynthesis **(3)**
Two hours of lecture and one hour of discussion. Advanced study of photosynthesis on the cellular and organismal level. Specific topics will reflect basic concepts and current emphasis in this field. Fall (odd years), 1979.
Prerequisite: Two semesters of physiology or a course in biochemistry.

660. Phytopathology **(3)**
Two hours of lecture and discussion and three hours of autotutorial laboratory. Principles and concepts of plant pathology. Major diseases of ornamental plants, vegetable crops, fruit crops, field crops, and trees. This is an introductory plant pathology course for graduate students in all departments. Spring, 1980.

661. Principles of Forest Pathology **(3)**
Four hours of lecture, discussion, and laboratory. Concepts and principles of tree diseases in relation to forest practices and practical experience in disease diagnosis and impact evaluation. Fall, 1979.
Prerequisite: FBO 360, 660, or permission of the instructor.

665. Principles and Practices of Tree Disease Control **(3)**
Two hours of lecture and three hours of laboratory or discussion per week. An advanced course considering the major chemical, cultural, and biological practices and integrated disease management strategies for tree disease control. Spring, 1980.
Prerequisites: FBO 510, 461, or permission of the instructor.

715. Advanced Systematic Botany **(2-3)**
Lectures and laboratory. Field trips. Advanced study in the identification, nomenclature, and classification of flowering plants. Special emphasis on Gymnospermae, Compositae, and Gramineae. Spring (even years), 1980.
Prerequisite: FBO 515 or equivalent.

725. Topics in Plant Ecology **(2)**
Two hours of seminar-discussion. An advanced course dealing with current research in plant community dynamics. May be repeated for additional credit. Fall, 1979.
Prerequisite: FBO 425 or 625 or permission of the instructor.

733. Techniques in Plant Physiology **(2-4)**
Comprehensive study of techniques essential for research in plant physiology. Students may choose the instructors they wish to work with, and should consult the instructors for further details. May be repeated for credit in different specialties. Fall, 1979.
Prerequisites: FBO 530 and 531 or an equivalent physiology course, biochemistry with laboratory, or permission of the instructor.

761. Topics in Phytopathology **(3)**
Two two-hour lecture-discussions. Discussions of specific subjects in phytopathology and wood microbiology. Topic selection is based on availability of expertise and will be announced in advance.This course may be repeated for credit in different specialties. Fall or Spring, 1979-80.

763. Mycorrhizae **(3)**
Two hours of lecture and three hours of laboratory/discussion per week. A basic background course covering structural, functional, and ecological aspects of mycorrhizae; their methods of field and laboratory study; and applications in forestry practice. Fall (odd years), 1979.

797. Botany Seminar **(1)**
Seminar discussions of subjects of interest and importance to the biology of plants. Fall and Spring, 1979-80.

798. Research in Forest Botany (Credit hours arranged according to nature of problem)
Advanced study in research problems in forest pathology, wood deterioration, tree physiology, anatomy, mycology, ecology, taxonomy, and genetics. Typewritten report required. Fall and Spring, 1979-80.

810. Advanced Mycology, Homobasidiomycetes **(3)**
Review of selected literature as well as laboratory training in identification and research techniques. Fall (odd years), 1979.
Prerequisite: FBO 510.

811. Advanced Mycology, Heterobasidiomycetes **(3)**
Review of selected literature as well as laboratory training in identification and research techniques. Spring (even years), 1980.
Prerequisite: FBO 510.

812. Advanced Mycology, Ascomycetes **(3)**
Review of selected literature as well as laboratory training in identification and research techniques. Fall (even years), 1980.
Prerequisite: FBO 510.

813. Advanced Mycology, Myxomycetes, Phycomycetes, Fungi Imperfecti **(3)**
Review of selected literature as well as laboratory training in identification and research techniques. Spring (odd years), 1981.
Prerequisite: FBO 510.

830. Physiology of Growth and Development **(2)**
Lecture. A study of the growth and development of plants and the physiological and biochemical processes that influence the development of form and structure in higher plants. Fall (even years), 1980.
Prerequisites: FBO 530, 585, and organic chemistry or permission of the instructor.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1979-80.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1979-80.

FEN—ENTOMOLOGY (FOREST ENTOMOLOGY)

300. Principles of Forest Entomology **(3)**
Elements of insect classification, living requirements and control manipulations that are prerequisite, with further study, to an understanding of insects in relation to applied aspects of forestry. Two hours of lecture, three hours of laboratory field work. Spring, 1980.

350. Elements of Forest Entomology **(3)**
Two hours of lecture, three hours of laboratory/field work. General classification of insects, morphology, physiology, ecology behavior, and basic principles of population control. Emphasis through illustration is on the role of insects in the forest environment. Fall, 1979.
Prerequisites: FBO 100 and FZO 100.

402. Forest and Shade Tree Entomology **(3)**
Two hours of lecture, three hours of laboratory/field trip. Important forest and shade tree insects; detection, evaluation, prevention and control of their damage; their relation to silviculture and management of forests and shade trees. Spring, 1980.
Prerequisite: FEN 350 or FEN 300.

404. Wood Deterioration by Insects **(3)**
Three hours of lecture, discussion, and demonstration. Biology, identification, ecology of insect and wood interrelations; prevention of injury and control of insects injurious to forest products and wood in use. Spring, 1980.
Prerequisite: FEN 350, FEN 300 or permission of the instructor.

450. Forest and Aquatic Insects **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. The forest and aquatic insects of Cranberry Lake Region and their role in these environments and habitats. Insect collection required. Summer, 1980.

451. Pest Management—Theory and Practice **(2)**
Two hours of lecture for nine weeks; then one lecture hour and one three-hour laboratory for four weeks. A review of history and governmental policy of pest management, as well as basic instruction in theory and practicum. Spring, 1980.

452. Principles of Chemical Control **(3)**
Two hours of lecture; one three-hour laboratory. A study of the chemistry, toxicology, handling and application of chemicals used to manage pest populations. A primer for the State Pesticide Application examinations. Fall, 1979.
Prerequisite: FEN 451.

453. Biological Control **(2)**
Two hours of lecture. Theory and practice of biological control of insect pests and weeds. Emphasis on the ecology of major groups of predators, parasitoids, and pathogens used in pest management and interpretation of mortality. Fall, 1979.

460. Insect Behavior and Ecology **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. Descriptive, comparative, and experimental behavior of aquatic and terrestrial insect species of the Cranberry Lake Region. Field project, involving field study and paper required. Ecology of forest insects and field techniques used in their study. Emphasis on functional roles played by insects in forest ecosystems. Summer, 1980.
Prerequisite: FEN 350 or equivalent; background in introductory biology and ecology.

490. Medical Entomology **(3)**
Two hours of lecture, three hours of laboratory. Study of arthropods affecting man, domestic animals, and wildlife with emphasis on their biology, control, and relationship to vertebrate disease. Spring, 1981.
Prerequisite: A beginning course in biology, entomology, zoology or permission of the instructor.

510. Arachnology **(3)**
Two hours of lecture/discussion and three hours of laboratory. Introduction to biology and ecology of spiders, mites, scorpions and other arachnid groups. Laboratories emphasize classification and identification of specimens. Spring (even years), 1980.
Prerequisite: Course in general entomology or invertebrate zoology.

520. Aquatic Entomology **(3)**
Two hours of lecture and three hours of laboratory. The biology, ecology and identification of fresh water insects, with emphasis on the role of aquatic insects in the hydrobiome. Fall, 1979.
Prerequisite: FEN 350 or its equivalent.

560. Environmental Toxicology of Insecticides **(2)**
Two hours of lecture. Basis of action of insecticides in living systems, behavior of insecticides and microtoxicants in environment, interaction of insecticides and biological systems. Fall, 1979.
Prerequisite: FBL 330 or equivalent course in physiology or biochemistry.

580. Insect Morphology **(3)**
Two hours of lecture and three hours of laboratory. A comparative study of the external morphology of insects emphasizing evolutionary trends, especially modifications of homologous structures. Topics of special importance include intersegmental relationships, feeding, sensory mechanisms, locomotion, and reproduction. Spring, 1980.
Prerequisite: FEN 350.

610. General Insect Taxonomy **(3)**
Two hours of lecture and three hours of laboratory. Identification and classification of the important orders and families of insects; acquaintance with pertinent taxonomic literature and use of keys; and understanding of evolutionary principles and concepts and a knowledge of systematic theory and practice. Insect collection required. Fall, 1979.
Prerequisites: FEN 350, FEN 580.

630. Insect Physiology **(3)**
Two hours of lecture and three hours of laboratory. Study of the life processes in insects; introduction to modern physiological instrumentation and laboratory methods. Spring, 1980.
Prerequisite: FBL 330.

650. Histological Techniques **(2)**
Two three-hour laboratories. A study of the series of actions involved in preserving insect tissue through fixation, embedding, and staining and the process of observing and identifying tissue sections through microscopic analysis. Fall, 1979.
Prerequisite: Permission of the instructor.

660. Insecticide Toxicology Laboratory **(2)**
One hour of discussion and three hours of laboratory. Laboratory experiments in mode of action and behavior of insecticides, biological and instrumental analysis of insecticides including tracer analyses. Spring (odd years), 1981.
Prerequisites: FEN 560 or equivalent and permissión of the instructor.

796. Special Topics in Forest Entomology
(Credit hours arranged according to nature of work)
Special instruction, conference, advanced study, and research projects in the fields of insect toxicology, insect physiology, taxonomy of immature insects, phases of biology and ecology of insects. Typewritten report required in some fields. Fall and Spring, 1979-80.

797. Seminar **(1)**
One hour of conference per week. Assigned reports and discussion of topics in entomology. Fall and Spring, 1979-80.

798. Research Problems in Forest Entomology
(Credit hours arranged according to nature of problem)
Comprehensive report required in some projects. Fall and Spring, 1979-80.

810. Advanced Insect Taxonomy **(3)**
Two hours of lecture and three hours of laboratory. Methods, procedures, and concepts of systematics. Examples and material will be drawn from among important groups of forest insects. Fall, 1979.
Prerequisites: FEN 580 and FEN 610.

820. Taxonomy of Diptera **(3)**
One hour of lecture-discussion, six hours of laboratory. Methods and procedures for collecting, preserving, and determining generic and specific identifications of adult and larval flies will be practiced. Problems and concepts of Diptera systematics will be discussed. Fall (even years), 1980.
Prerequisites: FEN 350, FEN 580, FEN 610; FEN 810 suggested.

860. Advanced Toxicology of Insecticides **(3)**
Three hours of lecture and discussion. Review of current topics in toxicology of insecticides and related foreign compounds. Fall, 1979.
Prerequisites: FEN 560, FCH 530 and permission of the instructor.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1979-80.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1979-80.

FZO—ZOOLOGY (FOREST ZOOLOGY)

332. Wildlife Conservation **(3)**
Two hours of lecture, one hour of recitation. Introduction to the biological principles of conservation including the relationship of natural resources to modern society. The wildlife resource and its conservation will be emphasized. It is not designed for students concentrating in the area of Forest Wildlife Management. Fall, 1979.
Prerequisite: One semester of biological science.

381. Vertebrate Anatomy, Histology and Physiology I (4)
Three hours of lecture, three hours of laboratory. Vertebrate macroanatomy, microanatomy, and physiology with special emphasis on the skeletal, muscle, nerve, and endocrine systems. Fall, 1979.
Prerequisite: general zoology or general biology.

382. Vertebrate Anatomy, Histology and Physiology II (4)
Three hours of lecture and three hours of laboratory. Vertebrate macroanatomy, microanatomy, and physiology with special emphasis on digestion, metabolism, nutrition, circulation, respiration, excretion, and body defense and destructive systems. Spring, 1980.
Prerequisite: general zoology or biology.

411. Invertebrate Zoology (4)
Three hours of lecture, three hours of laboratory. Structure, function, classification, and evolution of invertebrates. Emphasis on ecological role of invertebrates in specific habitats. Fall, 1979.

413. Biology of Birds and Mammals (4)
A course surveying the taxonomy, anatomical-behavioral-physiological adaptations and natural history of birds and mammals. Techniques for the field study of a vertebrate species will be discussed. Fall, 1979.

416. Ichthyology (3)
Two hours of lecture, three hours of laboratory. An introduction to the anatomy, physiology, ecology, behavior, and taxonomy of fishes. Spring, 1980.

423. Microcommunity Ecology (2)
Half-time for four weeks. Cranberry Lake Biological Station. Study of terrestrial invertebrate microcommunities; descriptive and comparative assay of microhabitats incorporating experimental and field techniques. Summer, 1980.

424. Vertebrate Ecology (2)
Half-time for four weeks. Cranberry Lake Biological Station. Utilization of unique Adirondack forms and communities to study population dynamics, behavior, systematics, and ecological role of vertebrates; standard field and laboratory techniques. Summer, 1980.

426. Ecology of Adirondack Fishes (2)
Half-time for four weeks. Cranberry Lake Biological Station. Study of the ecology of fishes, with detailed individual investigation of the ecology of Adirondack fishes. Summer, 1980.

427. Field Ornithology (2)
Half-time for four weeks. Cranberry Lake Biological Station. Field study of the ecology, distribution and behavior of birds of the Adirondack region. Techniques used in conducting field studies in avian biology will be emphasized. Summer, 1980.

440. Fishery Biology (4)
Three hours of lecture and three hours of laboratory per week. Introduction to models of growth, mortality, production, and exploitation; aspects of fish ecology and behavior related to the dynamics and management of fish populations. Fall, 1979.
Prerequisite: FZO 416 or equivalent.

456. Wildlife Ecology and Management (3)
Three hours of lecture. A study of the ecological principles governing wild animal populations and their habitats and the relationship of these principles to management programs and decisions. Spring, 1980.
Prerequisites: FBL 320, general ecology or its equivalent.

457. Wildlife Management Practicum (2)
One hour discussion, three hours laboratory. Practical contact and experience with wildlife management techniques and programs; relates practices to principles of management. Designed for biology students wishing to pursue careers as wildlife biologists. Spring, 1980.
Co-requisite: FZO 456; Pre or co-requisite LIB 300.

470. Principles of Animal Behavior (3)
Three hours of lecture per week. A study of the basic principles of animal behavior, stressing exogenous and endogenous mechanisms of control. Spring, 1980.
Prerequisite: One year of biology.

475. Behavioral Ecology (2)
Half-time for four weeks. Cranberry Lake Biological Station. Study of the behavioral adaptations of animals to their environment. Emphasis will be placed on animal orientation and social behavior. Habitat selection and interspecific interactions will also be considered. Credit may not be received for both FZO 475 and FZO 470. Summer, 1980.

520. Terrestrial Community Ecology (3)
Three hours of lecture. Relation of terrestrial vertebrates and invertebrates to their physical, chemical, and biological environment. Emphasis on community principles, structural quantification, and evolutionary processes of terrestrial animals. Fall, 1979.
Prerequisite: A course in basic ecology.

553. Wilderness Wildlife Management (2)
Two hours of lecture followed by one hour of group discussion. Students will participate in a two-day field trip at Huntington Forest. Completion of a term paper will be required for graduate credit. Fall, 1979.

620. Invertebrate Symbiosis (3)
Two hours of lecture and one three-hour laboratory. An introduction to the ecology and evolution of interspecific relationships of invertebrates. Spring (even years), 1980.
Prerequisites: FBL 320, FZO 411.

621. Practicum in Terrestrial Community Ecology (1)
Three hour laboratory period. Intensive practical application of ecological prinkiples to the study of terrestrial animal communities. Includes experimental and field collection of data, quantifications, synthesis, and final reporting. Fall, 1979.
Pre- or co-requisite: FZO 520 or equivalent.

622. Ecological Energetics (3)
Two hours of lecture and three hours of laboratory or one hour of discussion. Investigation of the principles of energy flow in biological systems. Emphasizing understanding of energy transformations, energy budgets and energy structures of individual organisms, populations, and ecosystems. Spring, 1980.
Prerequisite: A course in general ecology.

635. Behavioral and Physiological Ecology (3)
Two hours of lecture and one hour of discussion. An examination of the concepts of animal adaptations to ecological change from a behavioral point of view. Particular emphasis will be placed on the role the environment plays in shaping the behavior of a given species. Behavioral and physiological responses to environmental conditions will be treated as a continuum. Spring (odd years), 1981.
Prerequisites: One course in ecology, behavior, and physiology.

650. Biology and Management of Waterfowl (2)
A consideration of the identification, life history, ecology, and economic importance of waterfowl of the Atlantic Flyway. The management of local, flyway, and continental waterfowl

populations, including the establishment of hunting seasons, will be discussed. One Saturday field trip. Fall (odd years), 1979.

Prerequisite: Permission of the instructor.

654. Habitat Inventory and Evaluation (3)

Four hours of lecture/discussion. Habitat analysis techniques are dealt with at two levels. Micro or taxon-specific techniques are surveyed and compared. Macro or regional inventory procedures are then examined. Finally, approaches to habitat evaluation are explored. Spring, 1980.

Prerequisites: A course in wildlife management principles and permission of the instructor.

655. Urban Wildlife (2)

Three hours of lecture-discussion with field trips. A study of the occurrence, adaptations, and values of wildlife in urbanized areas, with emphasis on current research and agency programs. Spring, 1980.

Prerequisite: Permission of the instructor.

659. Advanced Wildlife Management (3)

One hour lecture, four hours laboratory per week; two weekend field trips. For graduate students intending to enter the wildlife profession. Focus is on the application of ecological principles and management techniques in the planning of habitat and harvest management programs for wildlife. Extensive independent work required. Fall, 1979.

Prerequisites: FZO 456, FZO 457 or permission of the instructor.

720. Topics in Soil Invertebrate Ecology (3)

Two one-hour lecture-discussion periods and a three-hour laboratory. Study of literature relating to soil invertebrate microcommunities; taxonomy, culturing, and collection methods of soil fauna; student will conduct an individual research problem. Spring (odd years), 1981.

727. Seminar in Aquatic Ecology (1)

Two hours of lecture and discussion. A seminar to explore in some depth areas of current research in aquatic ecology. Fall (even years), 1980.

Prerequisite: Six credits in aquatic ecology.

750. Topics in Wildlife Biology (1-3)

Hours to be arranged. Group study of a wildlife management topic. Fall or Spring, 1979-80.

Prerequisite: Six credits of wildlife management courses.

797. Forest Zoology Seminar (1)

Two hours of discussion and assigned reports on current problems and new developments in forest zoology. Fall and/or Spring, 1979-80.

798. Problems in Forest Zoology (Credit hours to be arranged)

Individual study of special problems in forest zoology. One typewritten report (original and one carbon) required. Fall and/or Spring, 1979-80.

899. Master's Thesis Research (Credit hours to be arranged)

Research and independent study for the master's degree and thesis. Fall and Spring, 1979-80.

970. Topics in Animal Behavior (2)

Two hours of lecture and discussion. A seminar-type course designed to explore in depth selected and controversial subject areas in animal behavior. Fall or Spring, 1979-80.

999. Doctoral Thesis Research (Credit hours to be arranged)

Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1979-80.

FCH—CHEMISTRY

221. Organic Chemistry I **(3)**
Two hours of lecture, one hour of recitation. A survey of representative classes of carbon compounds with an emphasis on structure, nomenclature, and fundamental reactivity and other important properties, uses and characteristics. Fall, 1979.

222. Organic Chemistry Laboratory I **(1)**
One three-hour laboratory period. Laboratory techniques in organic chemistry. Melting points, distillation, recrystallization, extraction, column and thin layer chromatography, natural product isolation. Qualitative functional group analysis. Fall, 1979.
Co-requisite: FCH 221 or equivalent.

223. Organic Chemistry II **(3)**
Two hours of lecture, one hour of recitation. A study in depth of the reactivity characteristics of the various classes of carbon compounds. The relation of chemical reactivity and physical properties to electronic and three-dimensional characteristics of carbon compounds. Spring, 1980.
Prerequisite: One semester of organic chemistry.

224. Organic Chemistry Laboratory II **(1)**
One three-hour laboratory period. Continuation of FCH 222. Simple physical, quantitative, and instrumental techniques applied to organic chemistry. Gas chromatography, polarimetry, kinetics. Introduction to synthesis. Spring, 1980.
Prerequisite: FCH 222 or equivalent.
Co-requisite: FCH 223 or equivalent.

225. Organic Chemistry I **(3)**
Two hours of lecture, one hour of recitation. A survey of representative classes of carbon compounds with emphasis on structure, fundamental reactivity, and other important properties and characteristics relevant to biological systems. Nonchemistry majors. Fall, 1979.

226. Organic Chemistry II **(3)**
Three hours of lecture and discussion. The structure and reactivity of organic compounds, utilizing natural products as examples, will be studied in order to develop an organic chemical background for further study of biological chemistry. Spring. Nonchemistry majors. 1980.
Prerequisite: FCH 225 or equivalent.

325. Organic Chemistry III **(4)**
Two hours of lecture, one six-hour laboratory period. Classical and recent literature synthesis of organic compounds, employing advanced techniques. Fall, 1979.
Prerequisite: Two semesters of elementary organic chemistry.

380. Instrumental Methods of Analysis **(3)**
Two hours of lecture and one three-hour laboratory. Lecture includes theory, applicability, and limitations of a number of current methods of instrumental analysis. Laboratory sessions provide practice with several of these techniques. Spring, 1980.
Prerequisites: General chemistry and quantitative analysis.

384. Spectrometric Identification of Organic Compounds **(1-2)**
Two hours of lecture and discussion. The first half semester (1 credit) will deal with common classes of organic compounds; the second half semester (1 credit) will deal with more complex structures. The use of complementary information from mass, infrared, nuclear magnetic resonance, and ultraviolet spectrometry will be applied to identification of organic natural products. Spring, 1980.
Prerequisites: Organic chemistry; one semester of advanced organic chemistry for second credit.

410. Topics in the Chemistry of Pollution **(1-3)**
Discussion of some specific areas of current concern to the environmental chemist. Lectures by staff members supplemented by outside speakers from industry and governmental agencies. Three hours of lecture per week. This course is taught in modules. Spring, 1980.
Prerequisites: Organic chemistry and permission of the instructor.

450. Introduction to Polymer Science **(3)**
Three hours of lecture. Introduction to the chemistry, physics, and properties of synthetic polymers. Description and classification of polymers. Polymer synthesis and mechanism of polymerization. Polymer solutions and characterization. Polymer solid states, including discussion of rubber elasticity, glass transition, crystallization, viscoelasticity. Fall, 1979.
Prerequisites: One year of organic chemistry and one year of physical chemistry.

475. Wood Chemistry I **(2)**
Four hours of lecture first half of semester. Introduction to carbohydrate chemistry. Chemistry of cellulose, hemicelluloses, and lignin. Cellulose derivatives. Wood extractives. Bark chemistry. Distribution of the cell wall constituents in wood. Fall, 1979.
Prerequisites: FCH 221—224 or equivalent.

476. Wood Chemistry II **(2)**
Four hours of lecture second half of semester. Interaction of cellulose with water and alkali. Effect of acids on cellulose, hemicelluloses, and lignin. Sulfonation and oxidation of lignin. Action of alkali on cellulose, hemicelluloses, and lignin. Topochemistry of the major wood delignification reactions. Wood defects. Chemical by-products from wood. Manufacture of cellulose acetate and rayon. Fall, 1979.
Prerequisite: FCH 475.

477. Wood Chemistry III **(2)**
Chemistry of pectin and starch. Photosynthesis, with emphasis on the chemical, dark phase. Biosynthesis of sucrose, starch, and plant cell wall polysaccharides. Biosynthesis of aromatics, with emphasis on lignin. Effects of growth hormones on structure and chemistry of plant cell walls. Spring, 1980.
Prerequisite: FCH 475.

478. Wood Chemistry Laboratory **(1)**
Gravimetric determination of lignin in softwoods. Determination of the number-average molecular weight of ethylcellulose by osmometry. Estimation of the weight-average molecular weight of ethylcellulose by osmometry. Gel permeation chromatography of dextrans and calibration of a GPC column. Fall, 1980.
Prerequisite: FCH 475.

495. Introduction to Professional Chemistry **(1)**
The professional chemist and his relationships with industry, government, and universities. Employment opportunities for the chemist, professional organizations, and unions will be discussed. The selection of a senior research topic and a literature survey will be required. Fall 1979.
Prerequisite: Senior status.

496. Special Problems in Chemistry **(1-3)**
An opportunity for a special problem, technique development, independent or unstructured study in an area related to the chemical profession. The work may be technical, professional, or interdisciplinary. Advisors outside this department may be solicited. A brief proposal must be presented for approval with specific arrangements outlined including faculty advisor and objectives of the study. Evidence of competence and appropriate effort is required for credit. A written report will be expected. Fall and Spring, 1979-80.
Prerequisite: Upper division status.

497. Undergraduate Seminar **(1)**
One hour per week. Literature surveys and seminars on topics of current research interest and recent advances in chemistry. Spring, 1980.

498. Introduction to Research **(5)**
Eighteen hours of laboratory per week, library search and report writing. Solution of a selected research problem using special laboratory techniques. Typewritten report on data, procedures, results, and conclusions. Spring, 1980.

510. Aquatic Environmental Chemistry **(3)**
Three hours of lecture. Includes discussion of structure of water, its physical and biological chemistry, water treatment problems, nutrient cycles, trace organic pollutants, and the environmental chemistry of air/water and sediment/water interfaces. Fall, 1979.

520. Nuclear and Radiation Chemistry **(2)**
The two one-hour lectures will cover the information required for the basic understanding of nuclear reactions, the types of radiation emitted, the instrumentation necessary to detect and measure this radiation, the principles of radioisotope tracer techniques, and radiation chemistry which is the effect of radiation on organic systems. Visits to the Cornell Reactor and the Nuclear Medicine Department of the Upstate Medical Center will be arranged. Spring, 1980.
Prerequisites: Physical, organic and inorganic chemistry or by permission of the instructor.
Note: This course can be taken independently of FCH 521.

521. Nuclear Chemical Techniques **(1)**
The laboratory will consist of one four-hour laboratory class every two weeks, with one hour to be made up at the student's discretion to accommodate counting periods which extend over several weeks. A short movie by the AEC each week will be required for the sixth hour. The laboratory will give each student the opportunity to use the individual counting instruments, gain experience in the handling and preparation of radioactive samples and the use of the 1000-curie-cobalt source in radiation chemistry. Spring, 1980.
Prerequisites: Physical, organic, and inorganic chemistry or permission of the instructor. Advanced tentative registration is required.
Co-requisite: FCH 520.

530. Biochemistry I **(3)**
Three hours of lecture. General biochemistry with emphasis on cellular constituents and metabolic reactions. The chemical, physical, and biological properties of amino acids, proteins, carbohydrates and their intermediary metabolism will be discussed. The chemistry of enzymes, energy transfers, and biological oxidations will also be covered. Fall, 1979.
Prerequisites: One year of organic chemistry and one year of physical chemistry.

531. Biochemistry Laboratory **(2)**
Six hours of laboratory. This course will stress techniques used in biochemical research. Techniques used include various types of chromatography, electrophoresis, and spectrophotometry and methods involved in the isolation, purification, and assay of enzymes. Fall, 1979.
Prerequisite: One semester of quantitative analysis with laboratory.

532. Biochemistry II **(3)**
Three hours of lecture. Topics discussed are: application of tracer techniques to biochemistry, the chemical and biochemical properties of lipids, theories on the origin of life, photosynthesis and the biosynthesis of steroids and terpenes, plant aromatics, amino acids, porphyrins and other aspects of nitrogen metabolism. Spring, 1980.
Prerequisites: FCH 530 and its prerequisites.

539. Principles of Biological Chemistry **(3)**
Three hours of biochemistry with emphasis on their relationship to biology. Topics include basic metabolic pathways, structure, and function of proteins, enzymes, and nucleic acids, energy relationships and biochemical control mechanisms. Nonchemistry majors. Fall, 1979.
Prerequisite: A two-semester course in organic chemistry is desirable, but a one-semester course is acceptable.

540 Chemical Ecology
This course is the same as FBL 540. Refer to description on page 126.

551. Polymer Techniques (2)
One hour of lecture and discussion and three hours of laboratory; lab reports. Techniques of polymer preparation: free radical solution and emulsion polymerization, gel permeation. Molecular weight determination by light scattering, osmometry, viscosity, gel chromatography. Structure characterization by X-ray diffraction, electron microscopy, nuclear magnetic polarized microscopy, stress-strain and swelling equilibrium and thermal analysis. Fall, 1979.
Prerequisites: One year of organic and one year of physical chemistry.

552. Polymer Processing and Technology (3)
Industrial methods of production and processing of polymeric materials such as fibers, films, plastics, elastomers, foams, composites, adhesives, and coatings, including discussions on the correlation between polymer structure and polymer properties. Spring, 1980.

630. Plant Biochemistry (3)
Three hours of lecture and discussion. Includes the biochemistry of photosynthetic electron transport and phosphorylation, photosynthetic carbon fixation, photorespiration, nitrogen fixation, nitrate reduction, photochrome, and plant hormones. The economic, ecological, and environmental aspects of plant biochemistry will also be discussed. Spring, 1980.
Prerequisites: FCH 530—532 or FCH 539 or equivalent.

650. Physical Chemistry of Polymers I (3)
Three hours of lecture. Includes: thermodynamics of polymer solutions, phase equilibria, fractionation, structure-property relationships, elementary chain statistics, molecular geometry, network elasticity, polyelectrolyte theory, and viscosity. Fall, 1979.
Prerequisites: One year of organic chemistry and one year of physical chemistry.

651. Physical Chemistry of Polymers II (3)
Three hours of lecture. Viscoelasticity. The glassy state and glass transition temperature. The crystalline state and crystallization kinetics. Characterization of structure and morphology of polymer solid states. Survey of structure and properties of native polymers. Spring, 1980.
Prerequisites: One year of organic and one year of physical chemistry.

652. Organic Chemistry of Polymers I (3)
Three hours of lecture. A broad survey of the chemistry of polyfunctional molecules and methods for their conversion to high molecular weight materials. Synthesis of a variety of specialty polymers and chemical reactions on natural and synthetic polymers. Some relations between molecular structure and useful properties. Fall, 1980.
Prerequisite: One year of organic chemistry.

653. Organic Chemistry of Polymers II (3)
Three hours of lecture. Kinetics and mechanism of polymerization processes, with emphasis on addition polymerization reactions initiated by radical, cationic and anionic initiators. Mechanism of stereospecific polymerization. Structure of polymers. Reactions on polymers and their modification for specific end uses. Block and graft polymers. Spring, 1980.
Prerequisites: One year of organic chemistry and one year of physical chemistry.

681. Principles of Physical Chemistry (2)
Two hours of lecture on chemical kinetics. Collision theory in the gas phase, transition state theory, kinetics in liquid solutions, ionic reactions including electron transfer reactions, rate equations near equilibrium, enzyme kinetics, and photochemical reactions. Spring, 1981.
Prerequisites: CHE 656 (Chemical Thermodynamics) or permission of the instructor.

682. Principles of Organic Structure and Synthesis (3)
Three hours of lecture and discussion. A broad survey of strategies for constructing organic molecules and of physical and chemical methods for the elucidation of structure. Emphasis on material relevant to different chemical disciplines. Fall, 1979.
Prerequisite: One year of organic chemistry.

796. Special Topics in Chemistry **(1-3)**
(Credit hours arranged according to nature of topic)
Lectures, conferences, and discussion. Advanced topics in physical chemistry, organic chemistry, or biochemistry. Fall and Spring, 1979-80.

798. Research in Chemistry (Credit hours arranged according to nature of problem)
Independent research in physical and organic chemistry of synthetic polymers, physical and organic chemistry of natural polymers, organic chemistry of natural products, ecological chemistry and biochemistry. One typewritten report required. Fall and Spring, 1979-80.

884. Organic Natural Products Chemistry **(3)**
Three hours lecture. The chemistry of terpenoids, steroids, and alkaloids with an emphasis on the determination of structure by both modern instrumental methods and chemical degradation. Biogenetic considerations and the confirmation of structure by synthesis are covered. Fall or Spring, 1979-80.
Prerequisite: One semester of advanced organic chemistry.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1979-80.

997. Seminar **(1)**
Seminars scheduled weekly; an average of twenty to thirty seminars are given annually. Discussion of recent advances in chemistry. Credit is given only once to a student. Fall and Spring, 1979-80.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1979-80.

ERE—ENGINEERING (ENVIRONMENTAL AND RESOURCE ENGINEERING)

100. The Engineer and the Environment **(1)**
One hour of lecture per week. Introduction to engineering practice in relation to environmental considerations and the needs and resources of society. Historical development of engineering and technology. Mission and content of engineering curricula. Representative case studies and project assignments. Open to all students. Spring, 1979.

320. APL For Engineers and Scientists **(2 or 3)**
Programming and operation of time-sharing digital computer systems via the APL language. Analysis, modeling, and solution of basic problems in environmental science and engineering. Students desiring three credits will complete an original, substantial term project. Fall or Spring, 1979-80.
Prerequisites: Calculus and physics or permission of the instructor.

321. Analog Computation for Engineers and Scientists **(1 or 2)**
Programming and operation of electronic analog computers. Analysis, modeling, and simulation of dynamic phenomena and systems in environmental science and engineering. Students desiring two credits will complete an original term project. Fall or Spring, 1979-80.
Prerequisites: Calculus and physics or permission of the instructor.

350. Wood Preservation **(2)**
Two hours of lecture per week with some demonstrations. A survey of basic wood-water relationships, shrinking and swelling, elementary wood structure, wood permeability, capillary forces, heat transmission, agencies of wood deterioration, wood preservation processes, wood fire performance, fire tests, and fire retardant treatments. Not open to WPE students. Fall, 1979.

360. Structure and Properties of Wood **(2)**
One hour of lecture, three hours of lab. Structure of wood in relation to defects, properties

and uses. The variability of wood. Identification of major U.S. timbers by gross feature. Spring, 1980.

362. Mechanics of Materials (3)
Three hours of lecture. Theories of stress, deformation, and stability of common structural materials subjected to various force systems. Spring, 1980.
Prerequisites: Integral calculus and statics.

370. Introduction to Plane Surveying and Air Photo Interpretation (2)
Two hours of lecture and recitation, three hours of laboratory. This course runs for the first 10 weeks of the semester. Subject matter areas include introduction to theory of measurements and error, linear and angular measurements in horizontal and vertical planes, traversing and computations, construction layout, topographic map reading, interpretation of aerial photographs, basic measurements of aerial photographs. Spring, 1980.
Prerequisite: Plane trigonometry or permission of the instructor.

371. Surveying for Engineers (3)
Two hours lecture and recitation, three hours of laboratory. The principles of plane surveying for engineers. Subject matter areas include introduction to theory of measurement and errors, linear and angular measurements in both the horizontal and vertical planes, traversing and computations, horizontal and vertical control and associated computations, areal and volumetric computation, circular and parabolic curves, state plane coordinates, angular direction determination, public land surveys. Laboratory field work and computations culminate in a topographic map. Fall, 1979.
Prerequisites: Differential and integral calculus.

375. Elementary Corrosion (1)
One hour of lecture per week. Basic electro-chemistry, film formation and passivation, galvanic corrosion and pitting, cathodic and anodic protection, protective coatings and inhibitors. Application of the above in the home, car, field, at sea, and in industrial plants. Spring, 1980.

377. Process Control (2)
Two hours of lecture per week. The study of the basic principles of process control as applied both with or without electronic computers. The emphasis is on sensing and control elements, signal transmission, and noncomputerized controls. This course complements computer courses but does not go beyond the transmission of signals to computers and the response to return signals. Spring, 1980.
Prerequisite: Physics.

420. Computer Applications in Science and Engineering (3)
Principles and methods of mathematical modeling for analog and digital computer solution. Applications to data reduction and correlation, statistical analysis, process and equipment simulation, optimization and control, and computer-assisted instruction. Typical examples, class problems and student projects. Current status and future projection of computation equipment, software and operating techniques. Fall or Spring, 1979-80.
Prerequisites: Calculus and computer programming, or permission of the instructor.

440. Water Pollution Engineering (3)
Two hours of lecture and three hours of laboratory. Introduction to the physical, chemical, and biological parameters of waste water treatment processes and to the principles of the unit operations involved. Study of the design parameters and design procedures of waste water treatment systems. Fall, 1979.
Prerequisites: Physics and CHE 356 or equivalent.

441. Air Pollution Engineering (3)
Three hours of lecture and discussions. Study of the chemical, physical and meteorological principles of air pollution and its control. Local and global effects of air pollution. The

atmospheric survey. Examination of the operating principles and design parameters of the various air pollution control systems. Air quality and emission standards. Spring, 1980.
Prerequisites: Physics and CHE 356 or equivalent.

488. Engineering Economics (1)
This course provides students with the tools to understand the economic aspects of engineering and to evaluate engineering proposals in terms of worth and cost. Coverage extends through alternatives analysis, using rate of return, present worth, average annual cost and other methods, and evaluation of public activities focusing on benefit-cost analysis. General depreciation and income tax accounting are introduced. Fall or Spring, 1979-80.

496. Special Topics (1-3)
Lectures, readings, problems, and discussions. Topics as announced in the areas of environmental or resource engineering. Fall and/or Spring, 1979-80.

563. Photogrammetry I (3)
Two hours of lecture and discussion, three hours of laboratory and discussion. Basic photogrammetric and photo interpretation concepts as a means of acquiring reliable data for engineering and management planning. Potentials, limitations, instrumentation and unique requirements are considered. Fall and Spring, 1979-80.
Prerequisite: ERE 370 (or ERE 371 concurrent) or equivalent.

585. Microscopy and Photomicrography (3)
Two hours of lecture, one hour of demonstration, and three to five hours of laboratory. Principles of light microscopy and photo-micrography with extensive laboratory practice. Introduction to scanning and transmission electron microscopy. Fall, 1979.
Prerequisite: Permission of the instructor.

596. Special Topics (1-3)
Lectures, conferences, discussions, and laboratory. Topics in environmental and resource engineering not covered in established courses. Designed for the beginning graduate student or selected upper division undergraduate. Fall and/or Spring, 1979-80.

611. Energy: Production and Conservation (3)
Three hours lecture. An introductory graduate level course dealing with the forms and impacts of energy production and conservation. A review of basic mechanics and thermodynamics as related to heat and energy conversion fundamentals for a variety of fuel and energy resources, with special attention to biomass conversion focus on the residential/commercial sector. Field trips and student reports are required. Fall or Spring, 1979-80.

640. Water Resource Systems (3)
Three hours of lecture and discussion per week. Fundamentals of the systems approach to complex water resource problems. Characteristics of water resource systems, related to systems engineering methodologies. Quantitative and qualitative subsystems are considered in a technical nature which exposes the socio-legal-political interfaces of water resource decisionmaking. Spring, 1980.
Prerequisite: FEG 340 or equivalent.

643. Water Pollution Engineering (3)
Two hours of lecture and three hours of laboratory. Introduction to the physical, chemical, and biological parameters of waste water treatment processes and to the principles of the unit operations involved. Study of the design parameters and design procedures of waste water treatment systems. Fall, 1979.
Prerequisites: Physics and CHE 356 or permission of the instructor.
Note: A student may not enroll in or receive credit for both ERE 440 and ERE 643.

652. Remote Sensing Interpretation (3)
Two hours of lecture and three hours of laboratory per week. Introduction with a qualitative emphasis on the fundamentals of acquiring, analyzing, and utilizing remote sensing data in the

performance of natural resource inventories, environmental quality surveys, site development studies and land use analyses. Oriented for multidisciplinary participation. Fall and/or Spring, 1979-80.

Prerequisites: Physics and calculus or permission of the instructor.

Note: Not open to students having previous credit for FEG 352.

655. Remote Sensing Measurements **(3)**

One hour of lecture, one hour of discussion and three hours of laboratory comprising an indepth coverage of the theory, design, and application of remote sensing systems and techniques employed to obtain precise spectroradiometric measurements in vegetation surveys, site engineering, data acquisition endeavors and environmental monitoring efforts. Photographic and nonphotographic systems are considered. A variety of field and laboratory measurement endeavors employing precision remote sensing equipment is included. Fall or Spring, 1979-80.

Prerequisites: FEG 352 or ERE 652, and FEG 363 or ERE 563 or permission of the instructor.

658. Geometric Geodesy **(3)**

An introductory graduate level course for those without previous background in theoretical geodesy. Topics covered include position determination for short and long lines on the ellipsoid, the ellipsoidal triangle, the parametric equations, three-dimensional geodesy, and mappings of the ellipsoid. Fall, 1979.

Prerequisite: Permission of the instructor.

659. Astronomic and Gravimetric Geodesy **(3)**

An introductory graduate level course in geodetic astronomy and the gravity field of the earth. Topics covered include updating star positions; precise time keeping; position determination by natural and artificial satellites; the fundamental concepts of gravimetric geodesy, including the potential function; attraction; undulations of the geoid and deflections of the vertical. Fall, 1979.

Prerequisite: ERE 658.

660. Theory of Errors and Adjustments **(3)**

The theory of errors and adjustments, of observations oriented toward geodesy and photogrammetry. Topics include error definitions, weighted observations, method of least squares, matrix algebra in adjustments, variance-covariance matrix, the error ellipse and the general case of adjustment. Fall or Spring, 1979-80.

Prerequisites: Calculus and a beginning course in statistics.

664. Photogrammetry II **(3)**

Mathematical theory of photogrammetry including space resection, orientation, and intersection. The theory and use of photogrammetric analog computers in providing resource engineering maps. Fall, 1979.

Prerequisite: ERE 563 or equivalent.

670. Principles of Pulping and Bleaching **(3)**

Two hours of lecture and three hours of laboratory plus literature study of assigned topics, independent project planning and/or laboratory study. Discussion of pulping and bleaching processes. Effects of chemical and physical variables on the wood components and pulp properties; chemistry involved. Experiments in pulping and bleaching and pulp evaluation. Fall, 1979.

Prerequisites: Organic, physical, and analytic chemistry.

Note: A student may not enroll in or receive credit for both PSE 461 and ERE 670.

675. Principles of Unit Operations **(4)**

Three hours of lecture-discussion and one two-hour computation period per week. Fundamentals of fluid dynamics, heat and mass transfer, appropriate analogies and process applications. Stage operations and computation methods. Application to distillation, extraction, gas absorption, evaporation, crystallization and drying. Design, operation, and computer simulation of equipment. Fall, 1979.

Prerequisites: Calculus and physical chemistry or permission of the instructor.

677. Paper Properties **(4)**
Three hours of lecture, three hours of laboratory, and discussion plus evaluation of literature, independent project planning and/or laboratory study. Evaluation and study of the physical, optical, and chemical properties of paper and the interrelationships existing between paper manufacturing methods, papermaking additives, test results and the ultimate properties desired in the finished paper. Fall, 1979.
Prerequisite: Permission of the instructor.
Note: A student may not enroll in or receive credit for both PSE 465 and ERE 677.

678. Paper Coating and Converting **(3)**
Two hours of lecture and three hours of laboratory plus evaluation of literature, independent project planning, and/or laboratory study. Evaluation and study of the various coating materials and processes used by the paper industry. Introduction to polymers and their use in converting operations. Study of materials and equipment used in converting operations, fundamentals and parameters which control their use, effects on final properties of papers. Spring, 1980.
Prerequisite: PSE 465 or permission of the instructor.
Note: A student may not enroll in or receive credit for both PSE 466 and ERE 678.

680. The Anatomy and Ultrastructure of Wood **(2)**
Two hours of lecture and/or demonstration and discussion. The gross, microscopic and submicroscopic structure of wood including organization of the cell wall, distribution of chemical constituents and abnormalities in wood. Fall, 1979.

682. Transport Processes **(3)**
Two hours of lecture and three hours of laboratory. The relationship between wood structure and wood permeability, moisture movement, and heat transfer. Fire retardant and wood preservation treatments. Wood drying. Unsteady-state transport processes. An advanced laboratory problem with report in wood-moisture relationships, wood drying, the relationship between wood permeability and treatability, or wood preservative treatments. Spring, 1980.
Prerequisite: Permission of the instructor.

684. Mechanical Properties of Wood **(3)**
Two hours of lecture and three hours of laboratory. The effect of the anatomical and chemical nature of wood on its response to static and dynamic force systems. The theory of elasticity as applied to wood. Fall or Spring, 1979-80.
Prerequisite: Permission of the instructor.

685. Applied Electron Microscopy **(5)**
Two hours of lecture, two hours of laboratory/demonstration, minimum of 10 hours of individual laboratory. The theory and operation of the transmission electron microscope including specimen preparation, photographic technique and interpretation of micrographs. Fall, 1979.
Prerequisite: Consultation with the instructor.

686. Wood-Water Relationships **(3)**
Two hours of lecture and three hours of laboratory. Relationship between wood moisture content and its environment, electrical properties, theories of moisture sorption, hygroscopic swelling and shrinking, thermodynamics of moisture sorption, mechanism of moisture movement. Fall, 1979.
Prerequisite: Permission of the instructor.

688. Tropical Timbers in Commerce **(2)**
Two hours of lecture. Introduction to the commercial use of tropical timbers; the factors of forest conditions, stand types and wood qualities influencing their utilization and the development of trade. Sources of information. Spring, 1980.
Prerequisite: Permission of the instructor.

689. Tropical Wood Anatomy **(1)**
Anatomical characters, identification and taxonomy of tropical woods important in commerce. Spring, 1980.
Prerequisite: WPE 386 or 387. Recommended that ERE 688 be taken concurrently or previously.

691. Air Pollution Engineering **(3)**
Three hours of lecture and discussion. Study of the chemical, physical, and meteorological principles of air pollution and its control. Local and global effects of air pollution. The atmospheric survey. Examination of the operating principles and design parameters of the various air pollution control systems. Air quality and emission standards, Spring, 1980.
Prerequisites: Physics and CHE 356 or permission of the instructor.
Note: A student may not enroll in or receive credit for both ERE 441 and ERE 691.

760. Analytical Photogrammetry I **(3)**
Two hours of lecture and three hours of laboratory per week. Mathematical theory of photogrammetry including space resection, orientation, intersection and aerial triangulation. Fall or Spring, 1979-80.
Prerequisites: FEG 363 and APM 360 or equivalent.

762. Instrumental Photogrammetry I **(3)**
Two hours of lecture and three hours of laboratory. The theory and practice of extracting information from photographs with the aid of photogrammetric plotters. Fall or Spring, 1979-80.
Prerequisite: FEG 363 or equivalent.

775. Applied Thermodynamics **(3)**
The study and application of thermodynamics, including the first and second law, phase relationships, thermochemistry, the production of work and equilibrium relationships. Fall. or Spring, 1979-80.
Prerequisites: CHE 346, CHE 356, or equivalent.

785. Scanning Electron Microscopy **(3)**
Two hours of lecture/demonstration/laboratory. Six hours of independent laboratory experience per week. the theory and operation of the scanning electron microscope including specimen preparation, photographic technique, and interpretation of micrographs. Spring, 1980.
Prerequisite: Permission of the instructor.

796. Advanced Topics **(1-3)**
Lectures, conferences, discussions, and laboratory. Advanced topics in Forest Engineering, Paper Science and Engineering, and Wood Products Engineering. Fall and/or Spring, 1979-80.
Prerequisite: Permission of the instructor.

797. Seminar **(1-3)**
I. Forest Engineering topics. II. Paper Science and Engineering topics. III. Wood Products Engineering topics. Fall and Spring, 1979-80.

798. Research in Environmental and Resource Engineering **(Credit hours to be arranged)**
I. Independent research topics in Forest Engineering. II. Independent research topics in Paper Science and Engineering. III. Independent research topics in Wood Products Engineering. Fall and Spring, 1979-80.

880. Interpretation of Cellular Ultrastructure **(2)**
One hour of lecture and two hours of demonstration and discussion. The organization and sculpturing of the walls of plant cells; the cellulose microfibril, matrix and incrusting substances, and the warty layer. The ultrastructure and function of cytoplastic organelles in cells. The nucleus, the mitochondrion, the chloroplast, the endoplasmic reticulum, microtubules, the gap junction and the tight junction. The tools and techniques used for light and electron microscopic

study of cells, and the interpretation of structural evidence. Directed study and discussion of the latest (current) literature on pertinent topics. Spring, 1980.
Prerequisite: Permission of the instructor.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1979-80.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1979-80.

FEG—FOREST ENGINEERING

300. Introduction to Forest Engineering Design **(2)**
One hour of lecture and three hours of laboratory. An introduction to methodologies for general problem analysis and engineering design for resource utilization. Emphasis is placed on the relationship of engineered solutions of forestry problems and their effects on the resources and the natural environment. Fall, 1979.

340. Engineering, Hydrology, and Flow Controls **(4)**
Three hours of lecture and three hours of laboratory and discussion per week. Analysis of the waters of the earth, their occurrence, circulation, and distribution; physical properties and their interaction with their environment. Principles of hydrologic budgeting and routing; and basic hydraulics of open channel, conduit, groundwater and overland flow. Applications of probability as a basis for the design of solutions to groundwater, surface runoff, flooding and water supply problems. Spring, 1980.
Prerequisites: CIE 327, IOR 326, and APM 360.

342. Hydraulics in Construction **(4)**
Three hours of lecture, three hours of laboratory. The physical, mechanical, thermal, and hydraulic properties of fluids relevant to the construction industry. A study of solutions to hydraulic problems in contemporary construction activities. Not open for credit to forest engineering students. Spring, 1980.
Prerequisites: Physics and differential calculus.

350. Introduction to Remote Sensing for Engineers **(2)**
Two hours of lecture and three hours of laboratory per week. The fundamentals of acquiring, analyzing and utilizing remote sensing data in the performance of natural resource inventories, environmental quality surveys and site development analyses. Oriented for multidisciplinary participation. Spring, 1980.
Prerequisites: FEG 363 (or concurrent).

352. Introduction to Remote Sensing **(3)**

Two hours of lecture and 3 hours of laboratory per week. Qualitative and quantitative introduction to the fundamentals of acquiring, analyzing, and utilizing remote sensing data in the performance of natural resource inventories, environmental quality surveys, site development studies, and land use analyses. Oriented for multidisciplinary participation. Fall and Spring, 1979-80.
Prerequisites: Physics and calculus or permission of the instructor.

363. Photogrammetry **(3)**
Two hours of lecture and discussion, three hours of laboratory. Basic photogrammetric and photo interpretation concepts as a means of acquiring reliable data for engineering and management planning. Potentials, limitations, instrumentation, and unique requirements are considered. Fall and Spring, 1979-80.

410. Structures **(4)**
Three hours of lecture, three hours of laboratory. Engineering principles in the analysis, planning, design, construction, and maintenance of forest structures such as timber bridges, trusses, towers, dams, water supplies, sewage systems, and other facilities. Properties of timber, concrete, steel, and other structural materials. Fall, 1979.
Prerequisite: CIE 325 (or concurrent).

422. Production Systems Engineering **(4)**
Four hours of lecture per week. An introduction to concepts of production systems and procedures for planning, designing, and managing production and large-scale physical systems with an emphasis on the coordination of resources to achieve well-defined objectives. Topics include: the concept of systems analysis as a design process; linear and dynamic programming; and select mathematical and economic techniques applicable to resource engineering and management. Fall, 1979.
Prerequisites: ERM 206, FEG 300, APM 391, and MAT 585.

437. Transportation Systems **(4)**
Three hours of lecture and three hours of laboratory. Interrelationships among natural features, transportation types, design, and management objectives to provide the most effective system within the given framework. Basic engineering principles in the planning location, design, construction, and maintenance of suitable transportation systems to serve various aspects of forest resource management. Spring, 1980.
Prerequisites: ERE 371 and FEG 432 or equivalent.

447. Hydrologic and Quality Controls **(3)**
Two hours of lecture and three hours of laboratory per week. A continuation of FEG 340 coupled with principles and practices of water quality control for forested sites and low density areas. Design of facilities and systems for water, sewerage and waste water treatment and for the abatement of pollution from nonpoint sources. Planning and analysis for water resources development. Spring, 1980.
Prerequisites: FEG 340, ERE 488 and CIE 437 or equivalent.

464. Photogrammetry II **(3)**
Two hours of lecture, three hours of laboratory each week. General analytic photogrammetry including interior and exterior orientation systems, intersection, space resection and orientation. The design of photo coordinate, correction procedures for film deformation, lens distortions, atmospheric refraction and earth curvature. The planning and completion of a topographic mapping project. The design of optimum procedures for the photogrammetric project. Fall, 1979.
Prerequisite: FEG 363 or equivalent.

477. Survey Systems Design **(3)**
Three hours of lecture and discussion. A study of the development and present status of land surveys, including the U.S. Public Land System, plane coordinate system, land use and resource systems such as New York's LUNR system. The impact of survey upon land use. The design of future systems. Spring, 1980.

489. Forest Engineering Planning **(3)**
Two hours of lecture and three hours of laboratory. A synthesis of the fundamental areas of forest engineering in the planning of the physical development of the forest resources. Specific design studies will be made emphasizing the interrelationship of man, forest resources and their multiple services. These studies will lead to the development and application of planning to simulated realistic conditions. Spring, 1980.

498. Research Problem in Forest Engineering **(1-3)**
Independent research in topics in Forest Engineering for the highly motivated undergraduate student. Selection of subject area determined by the student in conference with appropriate faculty member. Tutorial conferences, discussions and critiques scheduled as necessary. Final written report required for departmental record. Fall and Spring, 1979-80.
Prerequisite: Permission of the instructor.

PSE—PAPER SCIENCE AND ENGINEERING

300. Introduction to Papermaking **(3)**

Three hours of lecture. Historical and commercial consideration of the paper industry. Technology of papermaking with emphasis on stock furnish, stock preparation and paper machine operation. Introductory discussions of papermaking materials and formation and reactions of a fibrous web. Fall, 1979.

301. Pulp and Paper Processes **(3)**

Three hours of lecture. Technological consideration of pulping and bleaching of woody raw material. Includes consideration of wood procurement and preparation, pulping and bleaching processes, recovery of secondary fibers, pollution abatement and other ancillary operations. Spring, 1980.

Prerequisites: FCH 475 and 476, PSE 300 (or concurrent).

302. Pulp and Paper Processes Laboratory **(1)**

One three-hour laboratory. Study and practice in the techniques of laboratory procedures normally encountered in the pulp and paper industry. Laboratory exercises selecting and using standard testing methods. Field trips to observe commercial equipment of the pulp and paper industry. Spring, 1980.

Prerequisite: PSE 301 (or concurrent).

304. Mill Experience **(2)**

Twelve weeks full-time pulp or paper mill employment approved by the Department between the junior and senior years. The student must submit a comprehensive report to fulfill this requirement. An adaptability rating chart furnished by the Department is prepared by the mill for each student employed. Summer, 1980.

370. Principles of Mass and Energy Balance **(3)**

Three hours of lecture. Study of the properties of steam and solving problems connected with material and energy balances. Fall, 1979.

Prerequisites: Calculus, physics, and CHE 346 (or concurrent).

371. Fluid Mechanics **(2)**

Two hours of lecture and/or demonstration. The study of momentum transfer. Flow of liquids and gases in pipelines, ducts and open channels. Newtonian and non-Newtonian flow. Pulp and blower characteristics and selection. Flow measurements and flow system design with economic considerations. Fall, 1979.

Prerequisites: Calculus and physics.

372. Heat Transfer **(2)**

Two hours of lecture and/or demonstration. The study of heat transfer including conduction, convection, radiation and their applications in industry. Heater and heat exchanger design and selection, and industrial evaporation. Spring, 1980.

Prerequisites: PSE 370 and 371 or equivalent.

461. Pulping Technology **(3)**

One hour of lecture and six hours of laboratory. Discussion of pulping and bleaching processes: effect of chemical and physical variables on the wood components and pulp properties; chemistry involved. Experiments in pulping and bleaching, and pulp evaluation. Fall, 1979.

Prerequisites: PSE 301, CHE 346 and CHE 356.

Note: A student may not enroll in or receive credit for both PSE 461 and ERE 671.

465. Paper Properties **(4)**

Three hours of lecture, three hours of laboratory and discussion. Evaluation and study of the physical, optical, and chemical properties of paper and the interrelationships existing between paper manufacturing methods, papermaking additives, test results and the ultimate properties desired in the finished paper. Fall, 1979.

Prerequisites: PSE 301 and PSE 302.

Note: A student may not enroll in or receive credit for both PSE 465 and ERE 677.

466. Paper Coating and Converting (3)

Two hours of lecture and three hours of laboratory. Evaluation and study of various coating materials and processes used by the paper industry. Introduction to polymers and their use in converting operations. Study of materials and equipment used in converting operations, fundamentals and parameters which control their use, effects on final properties of papers. Spring, 1980.

Prerequisite: PSE 465.

Note: A student may not enroll in or receive credit for both PSE 466 and ERE 678.

468. Papermaking Processes (3)

One hour of lecture and six hours of laboratory. Laboratory study of the papermaking process, with emphasis on operation of the semicommercial Fourdrinier paper machine. Emphasis is on the fundamentals of stock preparation, paper machine operation, evaluation of the finished product and the collection and analysis of data to develop material and energy balance. Results of each paper machine run are evaluated in seminar-type discussions. Spring, 1980.

Prerequisites: PSE 461 and PSE 465.

473. Mass Transfer (3)

Three hours of lecture. The study of mass transfer, humidification, air conditioning, drying, gas absorption, distillation, leaching, washing, and extraction. Fall, 1979.

Prerequisites: PSE 370, 371, and 372 or equivalent.

491. Paper Science and Engineering Project 1 (1)

Student makes a systematic survey of all available literature on the problem assigned him and incorporates it in a formal, typewritten report. An essential part of this report is a detailed outline of a research project which the student proposes to undertake during the next semester (PSE 492). Fall, 1979.

Prerequisites: PSE 300 and PSE 301.

492. Paper Science and Engineering Project II (3)

The analysis of a problem, the synthesis of a solution and the basic design of the facilities needed to solve a problem. Laboratory research, field work, and consulting as needed in addition to the literature survey completed in PSE 491. Progress reports and a final report and seminar-style presentation. Spring, 1980.

Prerequisite: PSE 491.

496. Special Topics (1-3)

Lectures, conferences, and discussions. Specialized topics in chemistry, chemical engineering, and physics as well as topics pertaining to management as related to the pulp, paper, paperboard, and allied industries. Fall and Spring, 1979-80.

498. Research Problem (1-4)

The student is assigned a research problem in pulping, bleaching, refining, additives, quality control of paper or paper products, or chemical engineering. The student must make a systematic survey of available literature on the assigned problem. Emphasis is on application of correct research technique rather than on the results of commercial importance. The information obtained from the literature survey, along with the data developed as a result of the investigation, is to be presented as a technical report. Fall and Spring, 1979-80.

Prerequisites: PSE 461 and PSE 465.

WPE—WOOD PRODUCTS ENGINEERING

300. Properties of Wood for Designers **(2)**
Two hours of lecture. An introduction to the basic structure and properties of wood for the designer. Discussion of the effects of wood structure and properties on practical woodworking techniques. Fall and Spring, 1979-80.

320. Polymeric Adhesives and Coatings **(2)**
Two hours of lecture a week. An introduction to organic adhesives and coatings for the purpose of being able to specify proper materials for particular applications. Knowledge acquired will allow the individual to understand product literature and specifications. Wood product systems are discussed in detail, but the principles involved are easily transferred to other substrate systems. A knowledge of chemistry is not required. Spring, 1980.

321. Adhesives and Coatings Laboratory **(1)**
Three hours of laboratory a week. Laboratory experiments to identify materials, methods of application and methods of evaluation of adhesives and coatings normally used in the wood industry. Spring, 1980.
Prerequisite: WPE 320 (or concurrent) or permission of the instructor.

322. Mechanical Processing **(3)**
Two hours of lecture and three hours of laboratory. Primary log reduction methods and industry practices. Lumber grading. Wood cutting principles. Machining practice in secondary wood-using industries. Experience in the operation of certain primary and secondary machining equipment. Fall, 1979.

326. Fluid Treatments **(2)**
Two hours of lecture. An introduction to wood-moisture relationships, wood permeability and pressure treatments, thermal conductivity, water-vapor movement, and drying and fire retardancy. The flow of fluids, heat and water vapor are treated as analogous phenomena and are related to the cellular structure of wood. Unsteady-state flow of gases, heat and water vapor are introduced. Spring, 1980.

327. Fluid Treatments Laboratory **(1)**
Three hours of laboratory a week. Laboratory studies in relative humidity measurement, wood-moisture relationships, the relationship between permeability and treatability, wood-preservative treatments, wood drying and flame testing. Spring, 1980.
Prerequisite: WPE 326 (or concurrent).

387. Wood Structure and Properties **(2)**
Two hours of lecture. Structure of wood and its relation to physical properties and uses. The normal variability of wood, abnormal growth, defects, deterioration of wood and their influence on properties and uses. Fall, 1979.
Prerequisite: FBO 100 or equivalent is recommended.

388. Wood and Fiber Identification Laboratory **(2)**
Six hours of laboratory. Wood and papermaking fiber identification using both gross and microscopic features. Fall, 1979.
Prerequisite: WPE 387 (or concurrent).

389. Wood Identification Laboratory **(1)**
Three hours of laboratory. Identification of principal commercial timbers of United States on gross characteristics. Spring, 1980.
Prerequisite: WPE 387.

390. Field Trip **(2)**
Two weeks supervised study and reporting of representative wood products industries. Required of all students in WPE. Estimated individual expenses are $200-250 while on the trip. Summer, 1980.

400. Introduction to Forest Products **(2)**
Two hours of lecture. Characteristics of the products of the forest tree and manufacture of wood products. Fall or Spring, 1979-80.

404. Design of Wood Structural Elements **(3)**
Lectures plus laboratory exercises. A development of the principles involved in designing structural elements in wood and practice in their application. Fall or Spring, 1979-80.
Prerequisite: ERE 362.

422. Composite Materials **(3)**
Two hours of lecture and three hours of laboratory. Manufacturing methods and physical properties of wood laminates, fiberboard, particleboard, plywood, paper overlays, sandwich materials, wood-polymer composites and extruded and molded products. Fall, 1979.
Prerequisites: WPE 320 and WPE 326. Concurrent or prior registration in ERE 362.

442. Light Construction **(3)**
Two hours of lecture, two hours of discussion, problems and practice. Elements of light frame construction, blue print reading and estimating. Fall and Spring, 1979-80.

444. Materials Marketing **(3)**
Three hours of lecture and discussion. Marketing functions, agencies and management in the wood products and related industries. Principles of salesmanship and their application. Spring, 1980.

450. Construction Equipment **(3)**
Three hours of lecture. Principles of selection, operation, and maintenance of construction equipment. Primary types of site preparation, handling and assembly devices and their efficient utilization will be examined. Spring, 1980.
Prerequisite: Senior standing.

497. Senior Seminar for Wood Products Engineering Majors **(2)**
Discussion and assigned reports in current problems and new developments in Wood Products Engineering. Fall, 1979.

498. Research or Design Problem **(1-3)**
Conferences, library, laboratory and/or field research on a specific problem in Wood Products Engineering. Typewritten report (original and one copy) required. Fall and/or Spring, 1979-80.
Prerequisite: Permission of the instructor.

ENS—ENVIRONMENTAL SCIENCE

797. Environmental Science Seminar **(1-2)**
Discussion of current topics and research related to environmental science. Fall and Spring, 1979-80.

798. Problems in Environmental Science **(Credit hours to be arranged)**
Specialized study in the problem areas of Environmental Science for graduate students. Tutorial conferences, discussions, seminars, workshops, and critiques scheduled as necessary. Comprehensive report required for some subjects. Fall and Spring, 1979-80.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1979-80.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1979-80.

FOR—FORESTRY (RESOURCES MANAGEMENT)

100. Introduction to Forestry and Environmental Management (3)
Two 1½ hour meetings per week. An introduction to environmental and resources management. Emphasis is placed on the breadth of the field and on the important interrelations among the social, physical, and managerial aspects within which the environmental manager operates. Specific topics include: resources, institutions, values, the physical environment, the organism, the biological system, goals, management problems, information and analysis, and dealing with people. Fall, 1979.

201. Social Sciences I—Socio-Cultural Processes (6)
Six hours of lecture and discussion. Introduction to the concepts, theories, and terminology of psychology, anthropology, and sociology, which are relevant to the understanding of the interrelationships of human social groups with their environments and resources. Human social and cultural behavior as possible reflections of adaptations to past environments; human cultural and social organization as adaptations to resources of present-day environments; human ecology as it relates to human economic and political systems. Spring, 1980.

202. Social Sciences II: Economic Processes (6)
Five one-hour lectures and one one-hour discussion per week. The course has two major subdivisions: macroeconomic processes are concerned with the composition, measurement, and determination of national income, with the financial institutions of the United States and with fiscal and monetary policies; microeconomic processes are concerned with pricing of output and resource allocation, the theory of consumer demand, the theory of the firm and industrial organization, the role of labor unions in the United States and microeconomic policies of the federal government. Fall, 1979.

205. Introduction to Macroeconomics (3)
Three hours of lecture and discussion. Composition, measurement, and determination of national income. Financial institutions of the United States. Monetary and fiscal policies. The theory of economic growth and problems in attaining adequate levels of economic growth. Spring, 1980.

206. Introduction to Microeconomics (3)
Three hours of lecture and discussion. Pricing and resource allocation. Supply and demand. Theory of the firm and industry. The role of labor unions in the American economy. Problems in antitrust policy. The theory of international trade. Fall, 1979.

300. Summer Program in Field Forestry (6)
Fundamental training in forestry disciplines demonstrating elements of resource inventory, ecology and utilization within the context of total resource management. Course consists of five six-day weeks of field exercises, reports and projects in areas of surveying and cartography, forest and tree measurements, dendrology, ecology, and utilization of forest goods and services. Daily exercises develop understanding through active physical participation by students. Two repeating sessions per summer held at Warrensburg Campus. A service charge is required covering individual expenses while in residence at Pack Demonstration Forest, Warrensburg, New York. Summer, 1980.

321. General Silviculture (3)
Two hours of lecture and one three-hour laboratory first half of semester, three hours of lecture last half of semester. Survey of silvical principles and concepts and practice of silviculture for the production of goods and services from the forest. Designed for students in curricula other than resources management. Not available for resources management majors. Fall, 1979.

322. Introductory Forest Mensuration **(3)**
Two hours lecture and discussion, one three-hour laboratory. Principles and methods of estimation and measurement of forest trees and products, singularly and in the aggregate; of trees, forest products, forest stands, forest growth in time area and value. Determination by graphical and mathematical analysis of volume, growth, and valuation of wood products and other nonwood products and services of the forest through laboratory problems. Fall, 1979.
Prerequisite: Summer Field Program or permission of the instructor.

331. Introduction to the Physical Environment **(6)**
Lectures, discussions, field and laboratory work blocked in time and subject matter with FOR 332, Silvics-Silviculture. Study of the environmental media: air, soil, and water, through examination of the flow of energy and matter within and between these components of the environment. Drawing together information from geology, physical geology, soil science, water science and meteorology, this course provides understanding of these areas, their interactions and the interface with the biological system. Fall, 1979.
Prerequisite: Junior year standing in FOR curriculum or equivalent. Course should be taken concurrently with FOR 332, Silvics-Silviculture, because of the blocking of these two courses.

332. Silvics-Silviculture **(8)**
Three one-hour lectures and five three-hour labs or field trips per week. Fundamentals of silvics and practices of silviculture enabling manipulation of forests to attain objectives of the forest owner. Emphasis is placed on the biological interrelationships within the forest community, including site factors and forest stand dynamics, and the consideration of these in silvicultural operations. Fall, 1979.
Prerequisites: Summer Program in Field Forestry, and FOR 331 (taken concurrently) or permission of the instructor.

335. Regional Silviculture **(3)**
Three hours per week of classroom study. Topics cover regional factors that influence silvicultural methods commonly used in different forest types. Provides study of various silvicultural systems used in operating forest properties in various regions, with attention to geographical differences in land use, market opportunities, species characteristics, and economic conditions. Spring, 1980.
Prerequisite: FOR 332 or FOR 321.

345. Soils **(3)**
Three hours of lecture/discussion. Introduction to the fundamentals of soil science with particular reference to forestry, but including other land uses. Spring, 1980.

351. Meteorology and Fire Behavior **(3)**
Lectures and recitations in atmospheric physics and the physics and chemistry of combustion lead to discussions of fire behavior and the strategy and tactics of fire suppression. Fall, 1979.
Prerequisites: PHY 103 and 104 (Calculus helpful but not required).

360. Principles of Management **(3)**
Three hours of lecture and recitation. Basic principles and concepts of management which are universally applicable to any organization, business enterprise, or public agency. The various approaches to management including the classical, behavioral and quantitative concepts with emphasis upon the integrative approach, now required to meet modern society's changing life styles and values and the new awareness of the public regarding environmental matters and natural resources management. Spring, 1980.

362. Forest Information Systems **(4)**
Data needs, as specified by management goals and resource constraints, and the manner in which these needs influence acquisition, storage, retrieval, and prediction. Spring, 1980.

364. Soil and Water Conservation **(3)**
Three lectures per week. An integrated historical survey of water and related land resource conservation in the United States. Interrelationships of planning, administration, and evaluation of policies, programs and projects by all levels of government and private units. Spring, 1980.

370. Management of the Forest Enterprise **(3)**
Two hours of lecture and one hour of discussion/laboratory. This course is concerned with the management alternatives, both of a technical and social nature, that are available in the planning for and the production of timber, recreation, wildlife, forage, and water from the forest and with the criteria for choice to meet management objectives. Spring, 1980.

371. Range Management **(2)**
Two hours of lecture. Range ecology, animal husbandry, management practices and administrative aspects of range resources. Spring, 1980.

372. Planning and Developing Access for Forest Use **(3)**
Two hours of lecture, and one three-hour laboratory/discussion. Planning and developing suitable access necessary in producing a wide range of goods and services derived from forest land. Overland and aerial access systems including costs, consideration of user characteristics, aesthetics, standards, maintenance, and evaluation of alternatives in location and development. Fall, 1979.
Prerequisite: Senior standing or permission of the instructor.

373. Timber Harvesting **(3)**
Two hours of lecture and one three-hour laboratory/discussion. Harvesting as a production system including equipment, equipment mixes, costs and manpower in serving and logmaking and primary and secondary transportation. Evaluation of various systems as to environmental impacts. Wood as a raw material to the primary processing system and trees as inputs to the harvesting system. Spring, 1980.

400. The Social Environment of Resource Management **(3)**
Three hours of lecture and discussion. This course describes the institutional framework within which the resource manager practices his profession. It intends to show how economics, law, public policy, pressure groups and financial considerations constrain the professional judgment of the resource manager and the goals and objectives of the institution employing him. Fall, 1979.
Prerequisites: FOR 332, 360, 461, 322 and one hour of computer science; Senior standing.

402. Legal Aspects of Surveying **(3)**
Three credit hours of lecture and discussion. Fundamental principles of real property law with special reference to boundary survey, conveyances, rules of evidence, title insurance, rights, duties, and liability of professional land surveyors. Case material and appropriate New York State statutes will be discussed. Fall, 1979.

404. Economics of Wood-Using Industries **(3)**
Three hours of lecture and discussion. Structure and organization of selected wood-using industries. Analysis of decisionmaking by the firm. Principles of production and marketing including demand and cost analysis and pricing. Special issues and current problems of the industries, and introduction to the newer mathematical and statistical tools for meeting them. Spring, 1980.
Prerequisite: FOR 204 or equivalent.

405. World Forestry Resources: Problems and Prospects **(3)**
Three hours of lecture and discussion plus guided readings, pertaining to world forest resources and the problems and opportunities associated with their use and development. Major topics include: world forest resources; production and trade; principal wood-producing countries; forestry and the problems of underdevelopment; and special areas and topics of interest to world forestry. Spring, 1980.
Prerequisite: Senior status preferred.

429. Environmental Impact: Principles and Strategy **(3)**
Three hours of lecture and discussion. Principles and theory of environmental impact and statements of impact as required by federal law. Administrative procedures for review and evaluation. Procedural strategy and effective constitution before various governmental levels. Means of obtaining and sources of authoritative information. Spring, 1980.
Prerequisite: Senior standing.

433. Commodity Production Silviculture **(3)**
Six hours per week of lecture and study, or field work. Classroom instruction and exercises will introduce topics, followed by field exercises stressing application of silvicultural methods for growing wood products, mostly in hardwood stands. Topics will cover concepts, techniques, diagnostic methods, and field application for thinning, reproduction methods for even- and uneven-aged stands, assessing site and stand capabilities, and measuring and evaluating stand growth and development following management, where producing wood and other commodities represents a primary goal. Offered one day per week as a block of instruction and exercise. Spring, 1980.
Prerequisites: FOR 331-332, FOR 335, and one mensuration course beyond Summer Program in Field Forestry; Senior standing.

434. Greenspace Silviculture **(3)**
Two hours of lecture, one to three hours seminar or field trip per week. Concepts, techniques, and field practice of evaluating and manipulating vegetation systems, including site conditions, woody and herbaceous vegetation, and use impacts, primarily for on-site values in park, recreation, wildlife and multiple-use lands, roadsides, utility rights-of-way, protection areas, etc. Fall, 1979.
Prerequisites: At least one ecology and/or silvics course. Senior standing or permission of the instructor.

435. Integrated Use Silviculture **(3)**
Development of silvicultural decisions in management of woodlands to achieve results under various integrated use objectives. Four hours of lecture and seminar during first half of semester; six hours of field practice thereafter each week. Trips to forest areas. Several technical reports and a cultural plan prepared prescribing treatment to attain various ownership objectives. Spring, 1980.
Prerequisites: FOR 331 and 332 or permission of the instructor. Senior standing.

440. Forest Hydrology **(3)**
Two hours of lecture; three hours of laboratory. The relation of forest and range vegetation to its environment, and its effect upon soil and water. Measurement of precipitation, runoff, erosion, and other variables. Fall and Spring, 1979-80.

441. Forest Influences **(1-2)**
Half time for four weeks. Cranberry Lake Biological Station. Field observation of the effect of the presence of forest vegetation on easily quantified parameters of climate and the hydrologic cycle. Basic measurements of precipitation, radiation, temperature, interception, soil moisture, groundwater, and streamflow. Summer, 1980.

442. Practice of Watershed Management **(3)**
Two hours of lecture, three hours of laboratory. The impact of the multiple use of forest and range lands on water yield and soil stability. Regional problems and potential solutions. Spring, 1980.
Prerequisite: FOR 440.

446. Forest Soil Classification, Survey, and Interpretation **(3)**
Two hours of lecture/discussion, one three-hour laboratory period. Detailed examination of soil genesis and classification, and the survey and description of the soilscape. Interpretations are made for various land uses, especially forestry. Spring, 1980.
Prerequisites: FOR 331 or 345 or an introductory soils course.

452. General Meteorology **(3)**
Three hours of lecture. Examination of the physical processes of the atmosphere as they relate to the exchange of heat, moisture, and momentum in the earth-atmosphere system. Emphasis on the meteorological and micrometeorological basis of climate and its interaction with the biological world. Spring, 1980.

453. Biometeorology **(2)**
Two hours of lecture/discussion covering the fundamentals of organism-physical environment interaction. Spring, 1980.

455. Forest Tree Improvement **(3)**
Two hours of lecture, three hours of laboratory or field work. General principles and methods of tree improvement practiced in this country and abroad. Tree selection, techniques of vegetative propagation, hybridization, polyploidy, establishment of seed orchards, clonal and offspring testing and other problems. Spring, 1980.
Prerequisites: FBL 470, or Introduction to Mendelian Genetics or Population Genetics.

456. Management of the Forest Business **(3)**
Three hours of discussion. Overview of major business management principles and methods of operation in forestry enterprises. Emphasis is on general business concepts which forest managers must use. Actual case studies are basis of instruction. Complementary to RMP 611. Fall or Spring, 1979-80.

461. Management Models **(3)**
Two hours of lectures, three hours of laboratory. Introduction to the various models used in managerial decisionmaking. Emphasis is on the characteristics of the various models: their formulation, assumptions, uses, and limitations. The major topics covered will include: the role of models in management; simple optimization; constrained optimization; multi-valued choices; time adjustment of value; simulation; and models in nondeliberated decisions. Integration of the deliberative and intuitive models is stressed. Fall, 1979.

464. Applied Communications **(3)**
Two hours of lecture, three hours of laboratory during first part of course. Major media production project required. Course objective is to acquaint students with the basic principles of instructional communications in the teaching-learning process. Various media including television, motion pictures, exhibits, illustrated lectures, slide talks, newspapers, etc., are examined with emphasis on their utilization in environmental education. Also, consideration is given to instructional design for meeting predetermined learning objectives in various publics—lay and professional adult audiences, school children, etc. Spring, 1980.

465. Managerial Economics **(3)**
Three hours of lecture and discussion. Analysis of decisionmaking by the firm. Review of principles employed in modeling, predicting, risk assessment, evaluation and selection of alternative actions. Emphasis on economic and financial decisions and on the delineation of systematic processes of decision. Spring, 1980.
Prerequisite: Not available to Resource Management undergraduates except with permission of the instructor.

471. Resources Management **(3)**
Three hours of lecture/discussion/recitation/case studies. The interrelationships between man and forest land resources and the multiple services which these resources provide; the extent and nature of responsibilities of the resource manager to the community and to society in his stewardship of natural resources. Spring, 1980.

472. Fundamentals of Outdoor Recreation **(3)**
Three hours of lecture per week. Introduction to the programs and practices of federal, state, and local agencies and private organizations involved in planning, administration, and management of outdoor recreation areas. Emphasis is on major recreational issues and conflicts faced by area managers, and how they integrate solutions into their plans. Spring, 1980.

473. Planning and Development of Forest Recreation Areas (3)
Three hours of lectures or equivalent laboratory and assignments per week. Planning and designing forest recreation areas, structures, and facilities. Development of construction plans for camp and picnic sites, for waterfront areas and for trails. Emphasis is on the functional relationship between planning and design, management, and maintenance. Field trips required. Fall, 1979.
Prerequisites: FOR 472 and permission of the instructor.

475. Sociology and Psychology of Leisure Behavior (3)
Three hours of lecture and discussion. Introduction to theory and research findings dealing with the sociological and psychological aspects of leisure behavior; field work and lectures demonstrate applications, particularly with regard to leisure behavior. Spring, 1980.
Prerequisites: FOR 472, and an introductory course in sociology or psychology, or permission of the instructor.

477. Resource Policy and Management (3)
Three hours of lecture supplemented by one hour of discussion and/or lecture. Public and private forest policy formation; principles of modern management; overall management and operation of a productive forest property. Primarily for forest engineers. Not available to Resource Management undergraduates. Fall or Spring, 1979-80.
Prerequisites: Mensuration and silviculture, senior standing in Forest Engineering, or by permission of the instructor.

478. Marketing of Forest Products (3)
Three hours of discussion and analysis. Case study analysis of product, pricing and market research policies and problems of market structure in the lumber, pulp and paper and other major wood-using industries. Spring, 1980.

480. Urban Forestry (3)
Two hours lecture and three hours of laboratory or field trip per week. Introduction to urban forestry: its professional status and potentials. Elements of urban physical geography. Nature and functions of various kinds of urban greenspace; their physical and social interactions as an integrated system, and management within the broader context of urban processes. Field practice in evaluating urban greenspace resources. Spring, 1980.
Prerequisites: Senior status. FOR core courses or permission of the instructor. For students in other schools FOR 434 is desirable.

496. Special Topics in Environmental and Resource Management (1-3)
Guided readings, lectures, discussions, tutorial conferences, or special coursework designed to help the undergraduate student apply scientific analysis of a social, biological, or physical nature to questions within his area of interest. Questions and analyses would include those dealing with forest resources management and administration; forest cultural practices; land use and land use planning; hydrology and watershed management; outdoor recreation; resource economics; world forestry; and others. Fall and Spring, 1979-80.
Prerequisite: Permission of the instructor.

497. Resources Management Seminar (3)
Three hours of group discussion and analysis. Current literature, plans and principles, and new developments in forest management. Fall or Spring, 1979-80.

498. Special Studies in Environmental and Resource Management (1-3)
Independent research in environmental and resource management for selected undergraduate students. Selection of subject areas determined by the student in conference with appropriate faculty member. Final written report is required for departmental record. Fall or Spring, 1979-80.
Prerequisite: Permission of the instructor and department chairman.

499. Independent Study in Resources Management **(7-17)**
Independent study of some significant aspect of environmental and resources management. The selection of the topic will be determined by the student in consultation with his advisor. Guidance will be provided by a faculty committee. Limited to Spring semester seniors in Resources Management. Spring, 1980.

RMP—RESOURCE MANAGEMENT AND POLICY

587. Environmental Law **(3)**
Three hours of lecture and discussion. Studies in Environmental Law designed for resource managers. Review of structure and processes of American legal system, constitutional framework of environmental law, The National Environmental Policy Act, legal framework for management of federal lands, focus on legal aspects of common property resource management, land, water, and air. Fall or Spring, 1979-80.

588. The Law of Natural Resource Administration **(3)**
Three hours of lecture and discussion. An introduction to the law concerning the procedures, powers, and judicial review of public agencies responsible for the management of natural resources. Topics will include the extent of an agency's rule-making power and the rights of aggrieved parties to appeal from agency decisions. Spring, 1980.
Prerequisite: FOR 360 or equivalent course in public administration.

601. Resource Management Systems **(3)**
Three hours of lecture and seminar per week. Review of the structure and operation of the ecological and social environment within which resource managers operate. Major characteristics of the ecological utilization and control systems for forest and related natural resources are described and compared. Fall, 1979.

602. Resource Economics **(3)**
Three hours of lecture and discussion per week. Economic theory and analysis in resource management and use decisions. Study and application of economic models to land, water, forest, wildlife, and recreational resources. Relationships and interactions of public and private sector in resource management. Fall, 1979.
Prerequisite: Two semesters of undergraduate economics.

603. Research Methods in Resource Management and Policy **(3)**
Three hours of lecture and discussion per week. Study of the elements of research methodology including statistics and their application to analyzing and resolving problems both basic and applied in the managerial and policy sciences. Fall, 1979.
Prerequisite: Undergraduate statistics course.

606. Management Principles and Processes **(3)**
Three hours of lecture and group discussion. The central focus of this course is on decision-making, organization, and information theories as they relate to the total management process. Spring, 1980.
Prerequisite: Basic understanding of management functions and processes as found in FOR 360.

611. Economics of the Forest Business **(3)**
Two hours of lecture, three hours of laboratory. Economic evaluation of alternative uses of land, labor, and capital in the operation of forest properties and related marketing and processing enterprises. Emphasis is on application of principles and methods of economic analysis. Part of the term is spent in appraising a forest property and preparing a plan for its operation. Complementary to instruction in FOR 456. Spring, 1980.
Prerequisite: Permission of the instructor.

629. Environmental Impact: Principles and Strategies **(3)**
Three hours of lecture and discussion. Principles and theory of environmental impact and statements of impact as required by federal law. Administrative procedures for review and evaluation. Procedural strategy and effective constitution of statements for various governmental levels. Means of obtaining sources of authoritative information. Fall and Spring, 1979-80.

642. Water Quality Management **(3)**
Three hours of lecture and seminar per week. The review of the ethical, historical, legal, and technical basis for water quality management. Investigation of public policy on the international, federal, state, and local levels and the administrative methods and programs used to implement policy. Fall, 1979.

643. Urban Water Management **(3)**
Three hours of lecture and seminar per week. A review of the role of urban water management in water resources management. The problems and issues of providing water utilities services of water supply, drainage, and waste water facilities including such considerations as planning, financing, local government, intergovernmental relations, state and federal role, water institutions and applicable law. Spring, 1980.

650. Forestry and Economic Development **(3)**
Three hours of lecture and discussion. Study of the role of forest resources in the process of economic development. Characteristics of forest resources which are important for economic development are analyzed in detail. Interrelationships between biological, technological, and institutional factors are stressed. Fall, 1979.

662. Land Use Economics **(3)**
Three hours of lecture/discussion per week. Study of the theory and methods of land use economics and the application of economic analysis to open space and regional planning. Emphasis is on understanding basic concepts, developing of operational methods and data sources. Case studies, outside readings, and guest speakers are utilized. Fall, 1979.
Prerequisites: One course in macroeconomics and one in microeconomics and permission of the instructor.

664. Soil and Water Conservation **(3)**
Three hours of lecture and discussion. An integrated examination of the many aspects of the field of water and related land resource conservation in the United States. Topics include the evaluation and present status of planning, organizational, economic and legal constraints on the development of policies and programs of the federal agencies, state and local government and private units. Fall, 1979.
Prerequisite: Permission of the instructor.

670. Economics of Nonmarket Goods **(3)**
Group discussion, lectures, guided readings, case studies, and student projects on the economic aspects of watershed management, fish and wildlife management, and outdoor recreation. Major topics include theories of valuation and application to nonmarket goods, cost analysis for nonmarket goods, and measurement of regional impacts. Spring, 1980.
Prerequisites: FOR 206 or equivalent, knowledge of basic statistical analysis, and six hours or more of resource management coursework.

672. Open Space Planning (Recreation) **(3)**
Three hours of lecture/discussion per week. Study of methods and techniques applicable to open space planning in nonurban areas. Survey of literature and current research. Open space standards, classification systems, and inventory methods. Development of plans for large scale recreation areas, and inclusion of recreation into regional plans. The interrelationship and conflicts between resource utilization/development and recreation/aesthetics reviewed through case studies. Fall, 1979.
Prerequisites: One course in outdoor recreation, one course in planning, and permission of the instructor.

675. Psychology of Leisure Behavior (3)
Three hours of lecture and discussion. Introduction to theory and research findings dealing with the sociological and psychological aspects of leisure behavior: field work and lectures demonstrate applications, particularly in outdoor recreation. Spring, 1980.

751. World Forestry (3)
Three hours of lecture and discussion. World forest distribution and types; regional production and consumption of forest products; international trade in timber and related products; the role of forest resources in development; and special topics; tropical forestry, comparative forest policies and programs, forestry education, the problems of developing countries, international cooperation in forestry development, the role of the United States in world forestry, etc. Fall or Spring, 1979-80.

753. Resources Policy (3)
Three hours of lecture and seminar. Evaluation of basic environmental and resource issues and their evolvement in public and institutional policies. Exploration of alternative resource goals, policies, and program approaches and their implications. Analysis of processes for policy delineation and modification. Spring, 1980.

754. Advanced Forest Administration (3)
Critical appraisal of existing public, semipublic and private forestry agencies in the United States, and the comparative study of major administrative organizations and practices. Occasional inspection trips to forestry headquarters and field units and discussion of internal administrative problems with forest officers. Fall or Spring, 1979-80.
Prerequisite: FOR 360 or equivalent.

797. Seminar (1)
Group discussion and individual conference concerning current topics, trends, and research in management. Fall and Spring, 1979-80.

798. Research Problems in Resources Management and Policy
(Credit hours arranged according to nature of problem)
Special investigation and analysis of resources management problems where integrative relationships of several subject aspects of forestry are a major consideration. Fall and Spring, 1979-80.

899. Master's Thesis Research (Credit hours to be arranged)
Research and independent study for the master's degree and thesis. Fall and Spring, 1979-80.

999. Doctoral Thesis Research (Credit hours to be arranged)
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1979-80.

SIL—SILVICULTURE

520. Application of Ecology (3)
Two hours of lecture and discussion and one to three hours seminar, workshop, or field trip per week. Exploration of use and implications of ecological concepts for practices modifying terrestrial ecosystems for human benefit. Discussion of ecological writings in relation to applied problems; workshops, field trips and student presentations exploring ecological implications of specific situations. Course designed for interdisciplinary participation. Spring, 1980.
Prerequisite: An ecology course or permission of the instructor.

553. Energy Exchange at the Earth's Surface (3)
Two hours of lecture and three hours of laboratory. A comprehensive study of the physical processes taking place in the lowest layer of the atmosphere. Primary emphasis on the turbulent transfer of heat, momentum, and water vapor and the expression of these fluxes in the microclimate. Spring, 1980.
Prerequisites: FOR 452, physics, and calculus.

625. Productivity of Forest Stands (3)
Examination of forest tree and stand production variables as related to silvicultural manipulation. Analysis of stand response, such as rate of growth, stem form, product quality, tree quality, and value. Preparation of stand treatment schedules. Spring, 1980.
Prerequisite: Permission of the instructor.

635. Forest Soils and Their Analyses (3)
One hour of lecture, one hour of recitation, four hours of field and laboratory study of forest soils, emphasizing plant-soil relationships. Stress on quantification of plant-soil diagnostic techniques and their interpretation. Fall, 1979.
Prerequisite: FOR 446; background in physical and biological sciences recommended.

640. Advanced Wildland Hydrology (3)
Lecture, discussion, and laboratory sessions in advanced problems of forest and range hydrology, watershed management methods, and techniques and evaluation of new methods of hydrologic data collection and analysis. Fall, 1979.
Prerequisite: FOR 440 or FEG 340.

641. Watershed Analysis (3)
One hour of lecture and six hours of laboratory each week. Lecture and field experience in watershed characterization, inventory, and analysis in terms of land management problems. Fall, 1979.
Prerequisites: FOR 440 and permission of the instructor.

642. Snow Hydrology (3)
Three one-hour lectures per week and two three-day field trips. Physical characteristics of snow and the energy relations important in its accumulation and dissipation. Problems of measurement and prediction of runoff and melt. Potentials for management. Spring, 1980.
Prerequisite: FOR 440 or FEG 340.

677. Advanced Forest Tree Improvement (3)
Two hours of lecture and discussion and three hours of laboratory. A study of advanced principles and techniques for genetic improvement of forest trees. Special emphasis is placed on selection and breeding for growth rates, wood quality, and insect and disease resistance. Problems of tree hybridization, racial variations, sexual reproduction, and quantitative genetics in forest trees. Laboratory training in cytology and cytogenetics, pollen germination, vegetative propagation and other problems. Independent research problems will be undertaken by the student. Fall or Spring, 1979-80.
Prerequisites: FBL 470 and 471, FOR 455.

730. Research Methods in Silviculture (3)
Three hours of lecture or discussion. Research concepts and methodology with particular application to silviculture and its related sciences. More appropriate to beginning students or before taking thesis work. Fall, 1979.
Prerequisite: Permission of the instructor.

735. Forest Soil Fertility (Applied Studies) (2-4)
Two hours of lecture and one hour of discussion. Up to six hours of laboratory depending on number of credit hours. Influence of soil fertility on development and growth of seedlings and trees, and techniques involved to determine this influence. Chemical and biological analysis to determine levels of soil fertility. Nutrient element deficiencies and their correction by soil amendments and fertilizers. Term projects by the student will be undertaken. Spring, 1980.
Prerequisites: CHE 332 and 333, FBO 530, FOR 446 and SIL 635, or equivalent.

737. Forest Soil Physics **(4)**
Three hours of lecture and discussion and three hours of laboratory. Presentation of principles of soil physics including water flow, storage and availability, soil permeability, heat transfer, and their consideration as root environmental factors. Analytical procedures are introduced and evaluated. Applications of soil physics to silvics, soil fertility, watershed management and hydrology, soil biology and land-use. Spring, 1981.
Prerequisites: FOR 345, 446, or their equivalents. Physical chemistry and integral calculus strongly recommended.

777. Quantitative Genetics in Forest Tree Improvement **(3)**
Two-hour lecture and discussion and three hours laboratory. Development of statistical models for determining heritability in forest trees. Breeding models and computer analysis application in forest genetics. Fall or Spring, 1979-80.

796. Special Topics in Silviculture **(1-3)**
Lectures, seminars, and discussion. Advanced topics in silviculture. Check schedules of classes for details of subject matter. Fall and/or Spring, 1979-80, as appropriate.

797. Graduate Silviculture Seminar **(1)**
Three-hour class discussion per week. Assigned reports and discussion of silvicultural topics. Fall and Spring, 1979-80.

798. Research Problems in Silviculture
(Credit hours arranged according to nature of problem)
Fall and Spring, 1979-80.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1979-80.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1979-80.

FTC—FOREST TECHNOLOGY

200. Dendrology I **(2)**
Twenty-five hours of lecture and 34 hours of field time. A study of the distinguishing characteristics, growth features, distribution, associates and importance of the major tree species of North America. Seasonal field identification and on-the-spot discussion of habitats, associates, and the place in succession of the predominant forest trees and shrubs as found in the Adirondack area of the Northeast, plus a limited number of introduced species. Fall, 1979.

202. Plane Surveying I **(4)**
Fifty-four hours of lecture and 100 hours of field and laboratory time. An introduction to the theory and practice of plane surveying. Emphasis is on individual skill development through small crew projects, handling typical surveying equipment in typical field situations. Lecture topics include the theory of measurements and errors, mathematics for plane surveying, introduction to field problems and introduction to map use and preparation. Field projects include traversing, methods, and proficiency projects in handling typical surveying instruments. Fall, 1979.

203. Plane Surveying II **(3)**
Forty-two hours of lecture and 62 hours of field time. A continuation of FTC 202 with emphasis on small crew field projects including leveling, theodolite proficiency development exercises, triangulation, route surveying and determination of meridian. Classroom work develops the principles behind the solution to these field problems. Deeds and record keeping systems are discussed and a trip to the County Court House is scheduled to examine a typical record-keeping system. Other topics include the Surveys of the Public Lands and surveying as a profession. Spring, 1980.

204. Forest Mensuration and Statistics I **(3½)**
Sixty-seven hours of lecture and 36 hours of field time. A classroom and field study of the basic principles and skills required for timber measurements. Volume tables, their use and construction are studied. Cruise reports are required in which the student presents cruise results. Various methods of forest sampling are studied including methods of calculating necessary sampling intensities and sampling errors. Fall, 1979.

205. Forest Mensuration and Statistics II **(2)**
Four hours of lecture and 44 hours of field and laboratory time. A field problem of practical nature utilizing methods for collecting, analyzing, and presenting data dealing with timber volumes. Spring, 1980.
Prerequisite: FTC 204.

206. Forest Ecology **(3)**
Forty-two hours of lecture and 50 hours of field time. Study of weather and weather data collection; students manning a forest weather station. Study of weather and soil factors as to how they affect trees and forests, plus the interactions within the forest community and with the environment. Introduction to cover type mapping. Final field problem and report on detailed measurement and analysis of a belt transect. Fall, 1979.

207. Aerial Photogrammetry **(2)**
Twenty hours of lecture and 36 hours of laboratory. Development of the ability to interpret important ground features by viewing aerial photos singly and in pairs, using stereoscopic techniques and equipment. Scale problems and the making of reliable horizontal and vertical measurements. Radial line plot control for the transfer of detail to base maps. Forest type mapping and forest mensuration using photos. Fall, 1979.

208. Forest Installations **(3)**
Thirty-six hours of lecture and 60 hours of field time. This course provides the student with the technical competence necessary to use, plan, construct, and maintain such typical forest improvements as telephone lines, radio systems, trails, and light frame structures. Fall, 1979.

209. Forest Roads **(2)**
Twenty-two hours of lecture and 32 hours of laboratory time. This course provides the student with the technical competence necessary to administer, locate, and design the construction and maintenance of a typical forest gravel road. Spring, 1980.
Prerequisite: FTC 202.

211. Silviculture **(2½)**
Thirty hours of lecture and 40 hours of laboratory and field work blocked with forest management. Lectures based on text study cover orientation, terminology and present a framework of the various treatments used in many common stand conditions to bring the forest into a more productive state in accord with the objectives of management. Emphasis on thinning in computer simulation and field practice. Exercises in planting and pruning. Demonstrations in chemical silviculture. Spring, 1980.
Prerequisite: FTC 206.

212. General Forestry **(1)**
Sixteen hours of lecture. This course provides a brief overview of the development of forestry in the United States, the multiple-use concept of forestry, current public and private programs in forestry (including current events), and the place of forest technicians in forestry. Career opportunities for forest technicians are explored. Spring, 1980.

213. Forest Protection I **(2)**
Thirty-eight hours of lecture and 36 hours of laboratory/field time. A study of the insect and disease agents that damage trees and their role in the total forest community. The course covers identification of local forest insects and disease-causing organisms, study of the major pest groups of other forest regions, and control measures including the effects of pesticides on the environment. Field trips cover local pests and the damage caused, while laboratory work covers major groups of pests likely to be encountered elsewhere. Fall, 1979.

214. Personnel Management **(1½)**
Fourteen hours of lecture and 12 hours of laboratory time. A study of company and agency organization functions, including selection of and placement of personnel, training of personnel and performance evaluations, planning for and administering crew responsibilities, human relations in the working situation and special personnel problems of the forest are covered. Techniques of foremanship are applied in various field exercises in other courses, along with the duty of safety hazards, accident prevention, accident classification and accident reporting. Spring, 1980.

215. Timber Harvesting **(2)**
Sixteen hours of lecture and 36 hours of field time. This course acquaints the student with the basic harvesting methods and techniques, with emphasis on the Northeast, along with the knowledge of how and where harvesting fits in with other forest uses. Students gain technical competence in timber sale contract administration and basic timber appraising. Spring, 1980.

217. Forest Management **(2½)**
Thirty-six hours of lecture and 40 hours of laboratory and field work blocked with silviculture. Coverage of the common problems met in organizing a forest property to approach the goals of ownership. Study and practice in techniques of growth measurement and the gathering and use of forest records in general. Summary application of pertinent information from many other courses in a work plan involving management decisions for an assigned forestry property. Spring, 1980.
Prerequisite: FTC 206.

218. Forest Recreation **(1½)**
Fifteen hours of lecture and 32 hours of laboratory or field time. This course acquaints the student with the forest recreational resources—its present and future needs. Principles of recreation development and management are discussed with special emphasis placed on the technical aspects. Spring, 1980.

219. Elements of Wildlife Ecology **(1½)**
Twenty-eight hours of lecture and four hours of field time. A study of the principles of wildlife ecology with fundamentals related to the actions of the preservationist, conservationist, and particularly those of the forest manager. Spring, 1980.
Prerequisite: A course in biology or its equivalent.

221. Water Resource Management **(2)**
Twenty-seven hours of lecture and 40 hours of field time. A comprehensive study of the concepts of the hydrologic cycle and quantification of its components. Particular stress on basic water measurements, erosion-sedimentation, and protection of the soil-water resource. Spring, 1980.
Prerequisite: FTC 206; FTC 202.

223. Graphics **(1)**
Twenty-two hours of lecture. An introduction to lettering and drafting with emphasis on the skills needed by the forest or surveying technician. Individual skill development is achieved through several projects. The concept behind each project is explained in handout material and lecture, and each student is then expected to complete the project on his/her own time. Freehand and mechanical lettering plates are produced in addition to precision and pictorial drawings. Fall, 1979.

225. Regional Forestry Practices **(1)**
Forty hours of field time. An eight-day field trip to provide concentrated and varied field observation. It is conducted during the fourth semester to give the student first-hand observation of the current forestry practices in some region of the United States. Spring, 1980.

227. Forest Protection II **(2)**
Twenty-three hours of lecture and 24 hours of field and laboratory time. The basic principles of fire ecology, forest fire behavior, fire danger and fire danger rating, forest fire prevention and control, and prescribed burning are covered. Handtool fire suppression techniques are demonstrated and practiced. Spring, 1980.
Prerequisite: FTC 213.

228. Structure and Growth of Trees **(1)**
Thirteen hours of lecture and eight hours of laboratory. A study of the various tissues of forest trees and how their growth and development are affected by internal and external factors. Differences in stem structures of some of the more important commercial tree species of the United States are studied in the laboratory, and these differences are related to the commercial uses of these species. Spring, 1980.
Prerequisite: An introductory course in general botany or biology.

EIN—ENVIRONMENTAL INFLUENCES (LANDSCAPE ARCHITECTURE)
(See also courses listed under GRA and LSA.)

371. History of American Landscape Attitudes **(3)**
Three hours of lecture-discussion per week. This course presents, through lectures, readings, and slides, uniquely American historical attitudes toward land and nature as shown through various cultural activities and disciplines, such as painting, architecture, landscape architecture, religion, philosophy, utopianism, exploration and recreation, land development and economics, and certain technological developments. Cultural expressions of the 19th century will be of primary interest, but formative attitudes from the Colonial period and certain 20th century results will be included. One-third to one-half of lecture periods are given over to student reports, criticism, and discussion.
Prerequisite: Permission of the instructor. Spring, 1980.

411. Principles of Land Use and Planning **(3)**
Three hours of lecture, reports, assigned readings. Explanation of factors which influence the use, development, and control of land. Discussion of government's role in land development and control. Consideration of unique values of land competition for the use of space, planning for better land use, introduction to planning concepts and techniques, and other topics. Spring, 1980.

451. Fundamentals of City and Regional Planning **(3)**
Three hours of lectures, assigned readings, written reports per week. Discussion of the meaning and purposes of city and regional planning. Examination of the historical development of urban places. Explanation of the principal elements of the comprehensive planning process, including goal formulation and decisionmaking, social and advocacy planning, planning for community facilities and planning administration. Discussion of the methods and objectives of city and regional planning. Fall, 1979.
Prerequisite: Permission of the instructor.

470. Art History **(3)**
Three hours of lecture per week. Informal lectures will emphasize and review assigned text and other readings and handout notes. Slides will be shown regularly; reports, quizzes and examinations. Evolutionary nature of the main cultural periods of Western man and fine art as man's selected environment will be the course emphasis. Spring, 1980.
Prerequisite: Permission of the instructor.

471. History of Landscape Architecture **(3)**
Three hours of lecture per week. Informal lectures and class participation, reports, assigned text and assigned reserve shelf reading, optional text and handout notes, quizzes and exams. Slides. Historical study and style analysis of Western man's efforts to design his environment and his changing attitudes and relationships to environment. Also, non-Western coverage where significant or influential on Western Man. Study of historical personalities as well as periods that are of environmental concern up into the modern period. Fall, 1979.
Prerequisite: Permission of the instructor.

GRA—GRAPHICS (LANDSCAPE ARCHITECTURE)

(See also courses listed under EIN and LSA.)

380. Technical Drawing (1)

One three-hour drafting room period. Elements of perspective, isometric, oblique, and orthographic projection. Practice in freehand and instrument drawing. Fall, 1979.

381. Technical Drawing (2)

Two three-hour drafting room periods. Elements of perspective, isometric, oblique, and orthographic projection. Practical applications of these principles in machine and architectural drawing, including piping and electrical drawings. Spring, 1980.

382. Graphic Communication (2)

Two three-hour studios per week with up to one hour of studio per week devoted to group presentation meetings, instruction, and review of new techniques such as diagramming, drafting, perspective, and plan graphics. Drawings, examinations, and a final portfolio constitute the basis for grades. Text and drawing equipment and lab fee required. Fall, 1979.

482. Advanced Media (1-3)

Three hours of studio per week. Discussions, demonstrations, critiques and individual study. Study oriented toward perception and self-expression, use and possibilities of various media, as selected by student and instructor. Fall and Spring, 1979-80.

Prerequisites: Prior art media training or experience and permission of the instructor.

LSA—LANDSCAPE ARCHITECTURE

(See also courses listed under EIN and GRA.)

310. Elements of Landscape Architecture and Environmental Design for Architecture Students (2)

Two hours of lectures, discussions, and assigned readings per week. A successive presentation of a landscape architectural philosophy toward the physical environment and environmental design. Presentation of operational systems involved in the physical environment from technical, functional, and symbolic points of view. Fall, 1979.

Prerequisite: Enrollment in School of Architecture or permission of the instructor.

311. Elements of Landscape Architectural Practice for Architecture Students (2)

Two hours of lectures, problems, and assigned readings per week. An introduction to the design elements of Landscape Architecture in contemporary application and practice. Spring, 1980.

Prerequisites: LSA 310; enrollment in School of Architecture or permission of the instructor.

320. Introduction to Landscape Architecture and Planning (2)

Three hours of lecture per week. The course presents an overview of the professions of landscape architecture and planning. It surveys the historic and contemporary situations of environmental design and planning. The course introduces the socio-cultural and natural factors which influence the form and condition of the physical environment. It will introduce issues, personality, and projects. Fall, 1979.

326. Landscape Design Studio I (4)

Nine hours of laboratory design studio is the first in a sequence of studios focusing on the concepts, skills, and methods of design. This course introduces students to the basic vocabulary, concepts, and principles of design; the application and operation of these in the physical environment, development of three-dimensional spatial concepts. The requirements for this course include readings, examinations, field trips, design exercises, and projects. Enrollment or permission of the instructor. (Student field trip expense $125-150.) Fall, 1979.

327. Landscape Design Studio II **(3)**
Nine hours of studio per week. The second in a sequence of studios focusing on the concepts, skills, and methods of design. This course continued the development of design abilities through study of the interrelationship between the requirements of a design established in a program, the visual character of the site and the development of a designed result. The development of spatial concepts whmch meet principles of composition organization and a given set of requirements. The requirements for this course include readings, examinations, field trips, design exercises, and projects. Spring, 1980.
Prerequisite: LSA 326 or permission of the instructor.

343. Structural Materials and Elements **(3)**
Three hours of lectures, problems, and assigned readings per week. Study of the physical properties of materials and structural elements commonly used in landscape architecture. Topics include elementary statics and strength of materials, wood, metal, plastics, concrete, masonry, retaining walls, dams, foundations. Spring, 1980.

345. Elements of Site Engineering **(3)**
Two hours of lectures and three hours of studio per week. Lectures, problems, drafting, modeling, and assigned reading. The study of land form and its technical expression through grading plans, sections, profiles, layout plans, and earthwork quantity computation. Principles of soil mechanics and land drainage and their application to surface and subsurface drainage systems. Spring, 1980.
Prerequisite: ERE 370.

422. Landscape Design Studio III **(4)**
Twelve hours of studio per week. Studio problems, research, drafting, and field trips. The processes and methods of design considerations of variances upon the natural physical environment, ranging from broad regional areas to specific site concerns. Fall, 1979.
Prerequisites: LSA 320, 326, and 327 or permission of the instructor.

423. Landscape Design Studio IV **(4)**
Twelve hours of studio per week. Studio problems, research, and drafting. Interaction of cultural influences with the physical environment, with attention focusing on the resulting forms. Observations and illustrations of people and places as inputs into the design process. Spring, 1980.
Prerequisite: LSA 422 or permission of the instructor.

425. Orientation for Experiential Studio **(3)**
Three hours of lecture and recitation. Investigation and documentation of an area of specialty, discussion, readings, and research. Fall and Spring, 1979-80.
Prerequisite: Permission of the instructor.

432. Plant Materials Culture **(1)**
Three lectures per week for five weeks. Grasses, arboriculture, propagation, transplanting, planting plans, and specifications. Fall, 1979.
Prerequisite: Permission of the instructor.

440. Site Development Systems **(3)**
Three hours of lectures, problems, and assigned reading per week. Study of various engineering systems as they relate to the design and development of land. Topics include pedestrian ways, utilities (water, solid waste, sewage, electric, gas), road location and design, shore protection, swimming pools. Fall, 1979.
Prerequisite: Surveying.

490. Social Behavior and the Designed Environment **(3)**
Three hours of class per week. Lectures, readings, discussion and project. An examination of the concepts of individual and social behavior in relation to the physical design of the environment, focusing on perceptual and cognitive evaluations as determinants of spatial meaning. Fall and Spring, 1979-80.

495. Selected Readings in Environmental Studies **(1-3)**
Exploration of selected readings in depth with individual independent study upon a plan submitted by the student and related to credit hours assigned. Upon approval of the instructor, the student may systematically investigate some subject area encountered in regularly scheduled courses or may initiate research on a variety of subject areas of determined relevance. Fall and Spring, 1979-80.
Prerequisite: Permission of the instructor.

496. Special Topics in Landscape Architecture **(1-3)**
One to three hours of class meetings per week. Special topics of current interest to undergraduate students in landscape architecture and related fields. A detailed course subject description will be presented as a topic area is identified and developed. Fall and Spring, 1979-80.
Prerequisite: Permission of the instructor.

498. Introductory Research Problem **(1-3)**
Guided study of a selection of problems relating to landscape architecture and environmental design. Emphasis on study procedure and methods employed. Enrollment at periodic intervals throughout the semester. Fall and Spring, 1979-80.
Prerequisite: Permission of the instructor.

522. Landscape Design Studio VI **(4)**
Twelve hours of studio per week. Studio problems, research, drafting and field trips. Concentration on complex urban problems. Concern for social and psychological considerations of the individual and large groups of people, their interaction and resultant forms of the environment. Spring, 1980.
Prerequisite: Permission of the instructor.

524. Experiential Landscape Studio Design **(16)**
Forty-eight hours per week. The articulation of the study proposal established in LSA 425, as approved by faculty, through research, readings, field study with graphic and written documentation, and group discussion. Academic study in an off-campus location in an area of landscape architectural significance, as described and delineated in a student-prepared proposal approved by the faculty. Not available for graduate credit. Fall or Spring, 1979-80.
Prerequisites: LSA 425 or equivalent and LSA 423 or permission of the instructor.

525. Landscape Design Studio VI **(4)**
Twelve hours of studio per week. Investigation of a problem in landscape architecture as proposed by the student and conducted in conjunction with faculty advisor. Spring, 1980.
Prerequisite: Permission of the instructor.

527. Landscape Design Studio VI **(4)**
Twelve hours of studio per week. Studio problems, research, reports, and field trips. Concentration on regional landscape problems, the techniques of their analysis and derivation of their significance to the practice of landscape design. Spring, 1980.
Prerequisite: Permission of the instructor.

529. The Major Elements of Environmental Design **(3)**
Lectures, readings, discussions, and studios. The course presents an introductory survey of environmental design methods and associated skills and techniques. While studio work is part of the course, no design background is required. Fall, 1979.

532. Woody Plant Materials **(3)**
Three hours of lecture per week. Field study, lectures, slide presentations, and readings. An elective course providing opportunity for extension of basic knowledge in the identification and design of woody plant materials in professional practice. Fall or Spring, 1979-80.
Prerequisites: LSA 533 and LSA 432 or permission of the instructor.

533. Plant Materials **(3)**
Field trips and discussion. Ornamental woody plant identification. Observation and sketches of outstanding examples of planting design. Three weeks following Spring Semester, 1980.
Prerequisite: Permission of the instructor.

545. Professional Practice Studio II **(2)**
Three hours of studio, one hour of recitation per week. Studio problems, research, discussion and recitation sessions on the processes and methods of office practice. Emphasis on all aspects of site-development. Spring, 1980.
Prerequisite: Permission of the instructor.

547. Principles of Professional Practice **(2)**
Two hours of lecture per week. Lectures, assigned readings, reports, cost estimates, specifications, contracts, professional ethics, registration laws, professional practice. Spring, 1980.

595. Selected Readings in Landscape Architecture **(1-3)**
Exploration of selected readings in depth with individual independent study upon a plan submitted by the student and related to credit hours assigned. Upon approval of the instructor, the student may systematically investigate some subject area encountered in regularly scheduled courses or may initiate research on a variety of subject areas of determined relevance. Fall and Spring, 1979-80.
Prerequisite: Fifth-year status or permission of the instructor.

598. Research Problem **(1-3)**
Independent study of selected areas of environmental interest. Emphasis on a self-disciplined study, development of procedures and techniques to be employed in environmental design and planning. Engagement with specific sites and problems as proposed for study by individual communities. Enrollment at periodic intervals throughout the semester. Fall and Spring, 1979-80.
Prerequisite: Permission of the instructor.

620. Graduate Studio I **(4)**
Six hours of studio and two lecture/seminar hours per week. An examination and evaluation of the landscape architectural design process with an emphasis on the methodological variations which occur in its definition and application. A variety of projects, scales, and programs are employed as a vehicle for study of the design process. Fall, 1979.
Prerequisite: Permission of the instructor.

650. Determinants of Urban/Regional Land Use Patterns **(3)**
Three hours of discussion per week. This course will provide an introduction to social science theories of urban and regional land use patterns. The nature of social, economic, and political processes are explored in order to determine how the relationship of such factors affects the spatial development of the urban and regional environment. Understanding of these processes provides a basis for urban and regional planning. Fall, 1979.
Prerequisite: Permission of the instructor.

651. Process of Urban/Regional Planning **(3)**
Three hours of seminar per week. The purpose of this course is the introduction of planning as a process of decisionmaking and to familiarize graduate students with its scope and content. The course relies upon lectures and readings to develop introductory knowledge as well as seminars and discussions to cover the constitutional basis, tools, and techniques and the current directions of planning. Spring, 1980.
Prerequisite: Permission of the instructor.

653. Environmental Land Use Planning **(3)**
An introduction to the interdisciplinary techniques and emphasis on environmental land use planning. Consideration of the underlying ecological and planning philosophies. Readings and discussions are used in order to familiarize students with the disciplines involved and the process of data analysis, synthesis, and plan formulation. Case studies and research projects used to enhance understanding. Fall and Spring, 1979-80.
Prerequisite: Permission of the instructor.

654. Urban/Regional Open Space Planning **(3)**
Three hours of seminar per week. An introduction of concepts of open space planning related to urban, suburban, new town, and regional land use. An investigation of contemporary methods for open space preservation through private and municipal efforts will include inventory and analysis techniques for identifying community needs and physical resources. Fall, 1979.
Prerequisite: Permission of the instructor.

655. Public Policy and the Urban Environment **(3)**
Three hours of seminar per week. This course investigates public policy decisions as they affect the physical and social patterns of the environment. Seminar discussions based on readings and case study investigation. Spring, 1980.
Prerequisite: Permission of the instructor.

697. Seminar—Topics and Issues of Physical Environment **(2)**
Current topics for discussion are selected in order to acquaint the entering graduate student with a generalized view of the issues of the physical environment. Fall, 1979.
Prerequisite: Permission of the instructor.

699. Research Methods and Techniques **(3)**
Three hours of lecture per week. The course examines the design and development of research problems pertinent to landscape architecture and environmental planning. The course will concentrate on three major areas: (1) Areas of Potential Research, (2) Research Methods and Techniques, and (3) Proposal Writing. A variety of approaches to research in human-environment interactions will be discussed and explored with reference to their relevance and applicability to graduate research. Spring, 1980.
Prerequisite: Permission of the instructor.

711. Human Behavior and Environmental Form **(3)**
Consideration of the nature and dynamics of people's movements in space as clues to their relationship with their environments. An examination of the basic social and behavioral concepts that relate to the human use of the urban environment. Concepts such as behavior patterns, territoriality, cognitive mapping, urban images, preference, neighborhood and community will be explored within the framework of "social space." The implications of such behavioral studies in the design of the environment will be considered. Fall and Spring, 1979-80.
Prerequisite: Permission of the instructor.

720. Graduate Studio II **(4)**
Six hours of studio and two lecture/seminar hours per week. An examination of the significance of behavioral research to landscape architectural design. The interrelationship between the design process as a professional approach and the techniques employed in the behavioral sciences will be examined. Application of design process and behavioral science techniques to a variety of projects will be explored in order to develop solutions supportive of human behavior. Spring, 1980.
Prerequisite: LSA 620 or permission of the instructor.

721. Graduate Studio III **(4)**
Six hours of studio and two lecture/seminar hours per week. An examination of the significance of natural sciences to design in landscape architecture. The interrelationship between landscape architectural design and current findings concerning the tolerances of the natural environment to alteration. Students are responsible for developing the organization, administration, and management of assigned projects. Fall, 1979.
Prerequisite: LSA 720 or permission of the instructor.

731. Plant Materials **(3)**
Seminars, individual conferences, field trips, readings. Guided individual study in aspects of plant materials related to landscape architecture. Fall or Spring, 1979-80.
Prerequisite: Permission of the instructor.

740. Landscape Architectural Construction **(3)**
Lectures, drafting. Detailed study of special landscape construction problems. Preparation of estimates, contracts, and specifications. Fall, 1979.
Prerequisite: Permission of the instructor.

752. Urban and Regional System Dynamics **(3)**
Lectures and workshop. The major concerns of this course are application of system dynamics; basic principles of system dynamics; and system dynamics modeling. This method is investigated as a useful tool in modeling many landscape architectural and planning problems. No prior computer experience is necessary. Fall, 1979.
Prerequisite: Permission of the instructor.

757. Methods of Corridor Location **(3)**
Three hours of lecture per week. This course emphasizes study of corridor types, traditional economic determinism, and the emergence of environmental, aesthetic, and social concerns. Landscape architectural methods for corridor location and evaluation are reviewed and compared. These methods include graphic overlays, an automated data bank, unified scoring systems, and multiple accounts. Students will engage a course project. Spring, 1980.
Prerequisite: Permission of the instructor.

796. Special Topics in Landscape Architecture **(1-3)**
One to three hours of class meetings per week. Special topics of current interest to graduate students in landscape architecture and related fields. A detailed course subject description will be presented as a topic area is identified and developed. Fall and Spring, 1979-80.
Prerequisite: Permission of the instructor.

797. Seminar **(2)**
Two hours per week. Discussion of current topics, trends, and research related to landscape architecture, planning, and management. Fall and Spring, 1979-80.
Prerequisite: Permission of the instructor.

798. Research Problem
(Credit hours to be arranged according to nature of problem)
Special study of assigned problems relating to landscape architecture or planning, with emphasis on critical thinking. Fall and Spring, 1979-80.
Prerequisite: Permission of the instructor.

799. Thesis Project Proposal Development **(1)**
One hour lecture/workshop per week. During this course, a student will prepare a proposal for a thesis/project in the MLA program. Fall, 1979.
Prerequisites: LSA 699 and permission of the instructor.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1979-80.

APM—APPLIED MATHEMATICS

360. Introduction to Computer Programming **(3)**
The basic course in computer use offered by the College. It is intended to provide the student with the skill and understanding needed to utilize digital computer languages or problem solving. The course will cover instruction in FORTRAN IV, and an ASSEMBLY language plus some discussion of PL/1, ALGOL, APL, and use of software operating systems. This course or a

demonstrated equivalent is a prerequisite to individual student use of the College computer facilities. Fall and Spring, 1979-80.

391. Introduction to Probability and Statistics **(3)**
Two hours of lecture, three hours of laboratory. Elementary probability, theoretical and sampling distributions, hypothesis testing, statistical estimation, analysis of variance, regression and correlation, nonparametrics and sampling concepts. Fall and Spring, 1979-80.
Prerequisite: Two semesters of calculus.

492. Forest Biometrics **(3)**
Two hours of lecture, three hours of laboratory. Analysis of variance including nested and cross-classification. Matrix approach to multiple linear regression and weighted least squares. Nonlinear regression. Sampling methods and design. Applications to forestry problems. Fall, 1979.
Prerequisite: APM 391 or equivalent.

500. Introduction to Computer Programming for Graduate Students **(3)**
This basic course in computer use offered by the College is intended to provide the student with the skill and understanding needed to utilize digital computer languages for problem solving. The course includes a rather detailed study of FORTRAN IV, plus some discussion of an ASSEMBLY language and moderate study of COBOL and APL. To provide completeness, some attention is also afforded to techniques of representing information, managing files, error control and to operating systems and job control. This course or a demonstrated equivalent is a prerequisite to individual student use of the College computer facilities. Fall and Spring, 1979-80.

605. Theory of Probability Distributions **(1-3)**
Three hours of weekly sessions over five to 14 weeks. Statistical problems and mathematical models; random experiments, random variables, probability, frequency and distribution functions of discrete, continuous and mixed random variables; functions of random variables and the probability distributions; mathematical expectation and its applications; discussion of the main theoretical distributions such as binomial, Poisson, negative binomial, normal, Gamma, Beta, exponential and others; applications of this framework to the model construction problem in the statistical, operations research and forest mensuration areas. Fall or Spring, 1979-80.
Prerequisites: Two semesters of differential and integral calculus and an introductory course in statistics, or permission of the instructor. The course can be taken in conjunction with APM 651—Operations Research I (for one credit hour) or independent of it for one to three credit hours.

610. Statistical Analysis **(3)**
Two hours of lecture and three hours of lab. A treatment of statistical inference, including paired design, group design, linear regression and correlation, one way analysis of variance and some applications of chi-square. Calculation of statistics, test of hypotheses and proper interpretation of calculated statistics. Fall, 1979.

620. Analysis of Variance **(3)**
Three hours of lecture and recitation and three hours of laboratory. Multiway classifications in the analysis of variance, with emphasis on the development of models, including randomized blocks, latin squares, split plots, and factorial designs with fixed effects, random effects, and mixed effects; multiple and partial regression and correlation (including curvilinear), using matrix methods; analysis of covariance. Fall, 1979.
Prerequisites: Graduate standing and an introductory course in statistics covering material through the one-way analysis of variance.

625. Introduction to Sampling Techniques **(3)**
Two hours of lecture and three hours of lab. Introduction to the scientific basis of sampling: selecting an appropriate sampling unit; choosing an efficient design; calculating sampling error; determining a sample size to meet stated objectives. Spring, 1980.
Prerequisite: APM 391 or equivalent.

630. Regression Techniques with Applications to Forestry **(3)**
Two one-and one-half hours of lecture per week. Review of matrix algebra, probability theory and statistical methods. Basic concepts in regression analysis. Classical linear regression model. Least and weighted least squares method. Dummy variables and their uses in regression and covariance analysis. Applications to problems of statistical prediction and estimation from the field of forestry in general and forest mensuration and inventory in particular. Fall, 1979.
Prerequisite: APM 391 or equivalent.

635. Multivariate Statistical Methods **(3)**
Estimation and inference for the multivariate normal distribution. Multivariate analysis of variances, factor analysis, principal components analysis, canonical correlation, discriminant analysis, cluster analysis. Spring, 1980.
Prerequisite: One semester of statistics.

651. Operations Research I **(3)**
Two one- and one-half hours of lecture. Stochastic OR models applicable to managerial process or systems analysis. Elements of probability theory, theory of games and decision theory, queuing model, simulation techniques with applications to queuing and inventory problems, and, if time permits, Markov chains. Fall, 1979.
Prerequisites: APM 391 and MAT 227 or equivalent.

652. Operations Research II **(3)**
Two one- and one-half hours of lecture. Deterministic OR models applicable to managerial problems or systems analysis. Elements of Matrix Algebra, solving simultaneous linear equations, mathematical programming, classical optimization techniques, Lagrange multipliers. Linear progamming transportation and allocation models, dynamic programming, network analysis and, if time permits, quadratic, parametric and integer programming. Spring, 1980.
Prerequisites: APM 391 and MAT 227 or equivalent.

EST—ENVIRONMENTAL STUDIES

100. Introduction to Environmental Studies **(3)**
Lecture and discussion on the nature of man, his social, cultural, economic and political institutions and how these condition his views of the environment. Fall, 1979.

LIB—LIBRARY (COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY COURSE)

300. Library Research **(1)**
Fifteen hours of class time per semester (usually the first five weeks). Introduction for students at all levels to basic library material and the research process leading to preparation of a bibliography. Fall and Spring, 1979-80.

SCE—SCHOOL OF CONTINUING EDUCATION

510. Creative Problem Solving Seminar **(3)**
Three hours of lecture and discussion per week. A course designed to extend the students' understanding and application of creative problem solving processes. One requirement will be to select and carry out an application of the techniques to a particular problem, with consultation and guidance from the instructor. Critique and survey of the literature on creativity, in-depth analysis of the synetics process and various procedures which have been developed for nurturing creative behavior comprise the essence of the program. Fall, 1979.
Prerequisite: Undergraduate degree or permission of the instructor.
Note: Also listed as EIN 510.

530. (FEN) Pest Identification, Biology and Management **(3)**
A study of the life history and management practices for pests common to the home, landscape and recreational areas. Suggested for pest control personnel and teachers of primary

and secondary science areas. Not open to College of Environmental Science and Forestry students. Summer, 1980.

Prerequisite: One course in biology.

576. Special Topics Course: Environmental Education Processes and Strategies (3)

Lectures, discussions, field problems, and structured outdoor laboratory assignments in environmental education processes and strategies for professional educators in elementary and secondary schools who are part-time, nonmatriculated at ESF. Summer, 1980.

Prerequisite: Permission of the instructor. Not acceptable for credit in graduate programs of the School of Forestry.

596. Special Topics in Resource Management (1-3)

Lectures, field exercises, guided readings and discussions, in a shortcourse format. The study of recent developments and applications in resource management. Illustrative topics include management of forest stands, resource economics, land planning or recreation planning and site development. Summer, 1980. Not acceptable for credit in graduate programs of the School of Forestry.

Prerequisite: Permission of the instructor.

State University of New York

State University's 64 geographically dispersed campuses bring educational opportunity within commuting distance of virtually all New York citizens and comprise the nation's largest, centrally managed system of public higher education.

When founded in 1948, the University consolidated 29 State-operated, but unaffiliated, institutions. In response to need, the University has grown to a point where its impact is felt educationally, culturally, and economically the length and breadth of the State.

More than 340,000 students are pursuing traditional study in classrooms or are working at home, at their own pace, through such innovative institutions as Empire State College, whose students follow individualized and often nontraditional paths to a degree. Of the total enrollment, more than 100,000 students are 24 years or older, reflecting State University's services to specific constituencies, such as refresher courses for the professional community, continuing educational opportunities for returning servicemen, and personal enrichment for the more mature persons.

State University's research contributions are helping to solve some of modern society's most urgent problems. It was a State University scientist who first warned the world of potentially harmful mercury deposits in canned fish, and another who made the connection between automobile and industrial smoke combining to cause

changes in weather patterns. Other University researchers continue important studies in such wide-ranging areas as immunology, marine biology, sickle-cell anemia, and organ transplantation.

More than 1,000 Public Service activities are currently being pursued on State University campuses. Examples of these efforts include: special training courses for local government personnel, State civil service personnel, and the unemployed; participation by campus personnel in joint community planning or project work, and campus-community arrangements for community use of campus facilities.

A distinguished faculty includes nationally and internationally recognized figures in all the major disciplines. Their efforts are recognized each year in the form of such prestigious awards as Fulbright-Hayes, Guggenheim and Danforth Fellowships.

The University offers a wide diversity of what are considered the more conventional career fields, such as engineering, medicine, literature, dairy farming, medical technology, accounting, social work, forestry, and automotive technology. Additionally, its responsiveness to progress in all areas of learning and to tomorrow's developing societal needs has resulted in concentrations which include pollution, urban studies, computer science, immunology, preservation of national resources, and microbiology.

SUNY programs for the educationally and economically disadvantaged have become models for delivering better learning opportunities to a once-forgotten segment of society. Educational Opportunity Centers offer high school equivalency and college preparatory courses to provide young people and adults with the opportunity to begin college or to learn marketable skills. In addition, campus based Educational Opportunity Programs provide counseling, developmental education and financial aid to disadvantaged students in traditional degree programs.

Overall, at its EOC's, two-year colleges, four-year campuses and university and medical centers, the University offers 3,600 academic programs. Degree opportunities range from two-year associate programs to doctoral studies offered at 12 senior campuses.

The 30 two-year community colleges operating under the program of State University play a unique role in the expansion of educational opportunity, by:

Providing local industry with trained technicians in a wide variety of occupational curricula;

Providing transfer options to students who wish to go on and earn advanced degrees, and;

Providing the community with yet another source for technical and professional upgrading as well as personal enrichment.

During its brief history, State University has graduated more than 650,000 alumni, the majority of whom are pursuing their careers in communities across the State.

State University is governed by a Board of Trustees, appointed by the Governor, which directly determines the policies to be followed by the 34 State-supported campuses. Community colleges have their own local boards of trustees whose relationship to the SUNY board is defined by law. The State contributes one-third to 40 percent of their operating cost and one-half of their capital costs.

The State University motto is: "To Learn—To Search—To Serve."

STATE UNIVERSITY OF NEW YORK

UNIVERSITY CENTERS

State University at Albany
State University at Binghamton
State University at Buffalo
State University at Stony Brook

COLLEGES OF ARTS AND SCIENCES

College at Brockport
College at Buffalo
College at Cortland
Empire State College
College at Fredonia
College at Geneseo
College at New Paltz
College at Old Westbury
College at Oneonta
College at Oswego
College at Plattsburgh
College at Potsdam
College at Purchase

COLLEGES AND CENTERS FOR THE HEALTH SCIENCES

Health Sciences Center at Buffalo University Center
Health Sciences Center at Stony Brook University Center
Downstate Medical Center at Brooklyn
Upstate Medical Center at Syracuse
College of Optometry at New York City
College of Veterinary Medicine at Cornell University*

AGRICULTURAL AND TECHNICAL COLLEGES

College at Alfred
College at Canton
College at Cobleskill
College at Delhi
College at Farmingdale
College at Morrisville

SPECIALIZED COLLEGES

College of Agriculture and Life Sciences at Cornell University*
College of Ceramics at Alfred University*
College of Environmental Science and Forestry at Syracuse
College of Human Ecology at Cornell University*
College of Technology at Utica/Rome
Fashion Institute of Technology at New York City**
Maritime College at Fort Schuyler
School of Industrial and Labor Relations at Cornell University*

COMMUNITY COLLEGES

(Locally-sponsored, two-year colleges under the program of State University)

Adirondack Community College at Glens Falls
Broome Community College at Binghamton
Cayuga County Community College at Auburn
Clinton Community College at Plattsburgh
Columbia-Greene Community College at Hudson
Community College of the Finger Lakes at Canandaigua
Corning Community College at Corning
Dutchess Community College at Poughkeepsie
Erie Community College at Buffalo
Fulton-Montgomery Community College at Johnstown
Genesee Community College at Batavia
Herkimer County Community College at Herkimer
Hudson Valley Community College at Troy
Jamestown Community College at Jamestown
Jefferson Community College at Watertown
Mohawk Valley Community College at Utica
Monroe Community College at Rochester
Nassau Community College at Garden City
Niagara County Community College at Sanborn
North Country Community College at Saranac Lake
Onondaga Community College at Syracuse
Orange County Community College at Middletown
Rockland Community College at Suffern
Schenectady County Community College at Schenectady
Suffolk County Community College at Selden
Sullivan County Community College at South Fallsburg
Tompkins Cortland Community College at Dryden
Ulster County Community College at Stone Ridge
Westchester Community College at Valhalla

*These operate as "contract colleges" on the campuses of private universities.
**While offering a limited number of baccalaureate degree programs, in addition to the associate degree, FIT is financed and administered in the manner provided for Community Colleges.

College of Environmental Science and Forestry

COLLEGE ADMINISTRATION

President	EDWARD E. PALMER
Assistant to the President	JENIFER BREYER
Assistant to the President for Community Relations	ROLLA W. COCHRAN
Vice President for Program Affairs	DONALD F. BEHREND
Acting Assistant Vice President for Research Programs	JAMES W. GEIS
Assistant Vice President for Academic Programs	ROBERT H. FREY
Coordinator of Sponsored Programs	J. DONALD MABIE
Acting Director, Institute of Environmental Program Affairs (IEPA)	JAMES W. GEIS
Coordinator of Demonstration and Information, IEPA	ROLLA W. COCHRAN
Vice President for Student Affairs	HARRISON H. PAYNE
Director of Admissions	ROBERT L. FRIEDMAN
Director of Financial Aids	JOHN E. VIEW
Registrar	ROBERT S. NORTH
Adjunct Foreign Student Counselor	VIRGINIA T. TORELLI
Vice President for Administration and Services	DAVID G. ANDERSON
Assistant to the Vice President	JUDITH A. LAMANNA
Director of Business and Fiscal Affairs	HARRY J. CORR
Librarian	DONALD F. WEBSTER
Acting Director of Educational Communications	BERNARD T. HOLTMAN
Director of Computer Services	CHARLES N. LEE
Director of Personnel and Affirmative Action	JOHN S. FORSTER
Director of Physical Plant	BRUCE E. REICHEL
Director of Campus Safety and Security	BRIAN M. SPEER
Associate for Institutional Research	RHONDDA K. CASSETTA
Director of Analytical and Technical Services	JOHN A. MEYER
Affirmative Action Officer	ALTON W. ZANDERS
Dean, School of Biology, Chemistry and Ecology	STUART W. TANENBAUM
Dean, School of Continuing Education	JOHN M. YAVORSKY
Dean, School of Environmental and Resource Engineering	WILFRED A. CÔTÉ, JR.
Dean, School of Forestry	JOHN V. BERGLUND
Dean, School of Landscape Architecture	ROBERT G. REIMANN
Director, School of Forest Technology	JAMES E. COUFAL
Director, Graduate Program in Environmental Science	ROBERT D. HENNIGAN
Director, Adirondack Ecological Center	WILLIAM C. TIERSON
Director, Empire State Paper Research Institute	BENGT LEOPOLD
Acting Director, Polymer Research Institute	KENNETH J. SMITH
Director, Ultrastructure Studies Center	WILFRED A. CÔTÉ, JR.
Director, Tropical Timber Information Center	ROBERT W. DAVIDSON
Director, Cellulose Research Institute	TORE E. TIMELL
Project Leader, U.S. Forest Service Cooperative Research Unit	ROWAN A. ROWNTREE

COLLEGE FACULTY AND PROFESSIONAL STAFF

This listing represents an official record of the State University of New York College of Environmental Science and Forestry faculty and professional staff for 1979. It is designed for use in 1979-80.

The date in parentheses after each name denotes the first year of service, two or more dates, the term of service. An asterisk (*) indicates graduate faculty.

LAWRENCE P. ABRAHAMSON (1977), *Senior Research Associate*, School of Forestry and Department of Environmental and Forest Biology; B.S., Michigan Technical University, 1964; M.S., University of Wisconsin, 1967; Ph.D., University of Wisconsin, 1969

JUDD H. ALEXANDER (1979), *Adjunct Professor*, Graduate Program in Environmental Science

MAURICE M. ALEXANDER (1949)*, *Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1940; M.S., University of Connecticut, 1942; Ph.D., State University of New York College of Forestry, 1950

DOUGLAS C. ALLEN (1968)*, *Associate Professor*, Department of Environmental and Forest Biology; B.S., University of Maine, 1962; M.S., 1965; Ph.D., University of Michigan, 1968

IRA H. AMES (1972), *Adjunct Associate Professor*, Department of Environmental and Forest Biology; B.A., Brooklyn College, 1959; M.S., New York University, 1962; Ph.D., 1966

DAVID G. ANDERSON (1959), *Vice President for Administration and Services; Associate Professor;* A.A.S., State University of New York College of Forestry (Ranger School), 1950; B.S., State University of New York College of Forestry, 1953; M.S., University of Utah, 1958; M.P.A., Syracuse University, 1972

ROBERT E. ANTHONY (1953), *Technical Specialist*, Department of Environmental and Forest Biology; A.A.S., State University of New York Agricultural and Technical College at Morrisville, 1952

GEORGE R. ARMSTRONG (1950)*, *Professor*, School of Forestry; B.S., State University of New York College of Forestry, 1949; M.S., 1959; Ph.D., 1965

ROBERT W. ARSENEAU (1972), *Programmer/Analyst*, Computer Center; A.A.S., Mohawk Valley Community College, 1967

JAMES P. BAMBACHT (1967)*, *Associate Professor*, Department of Paper Science and Engineering; A.B., Kalamazoo College, 1954; M.S., The Institute of Paper Chemistry, 1956; Ph.D., State University of New York College of Environmental Science and Forestry, 1973

C. ELLISON BECK (1970), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services

DONALD F. BEHREND (1960-67) (1968)*, *Vice President for Program Affairs*, Office of Program Affairs; *Senior Research Associate*; B.S., University of Connecticut, 1958; M.S., 1960; Ph.D., State University of New York College of Forestry, 1966

JOHN D. BENNETT (1960)*, *Associate Professor*, School of Forestry; Graduate Program in Environmental Science; B.A., Ohio Wesleyan University, 1954; Ph.D., Syracuse University, 1968; *Chancellor's Award for Excellence in Teaching* (1973)

JOHN V. BERGLUND (1965)*, *Dean*, School of Forestry; B.S., Pennsylvania State University, 1962; M.S., 1964; Ph.D., State University of New York College of Forestry, 1968

WILLIAM H. BETTINGER (1972), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services

DONALD H. BICKELHAUPT (1969), *Technical Assistant*, School of Forestry; B.S., State University of New York College of Forestry, 1969

PETER E. BLACK (1965)*, *Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., University of Michigan, 1956; M.F., 1958; Ph.D., Colorado State University, 1961; *Executive Chairman of the Faculty* (1974-76) (1976-78)

GARY BLISS (1972), *Technical Assistant*, Department of Environmental and Forest Biology; State University of New York College of Environmental Science and Forestry (Ranger School), 1972.

WILLIAM R. BORGSTEDE (1971), *Technical Assistant*, Department of Environmental and Forest Biology; A.A.S., Miner Institute, 1966; A.A.S., State University of New York College at Delhi, 1970; B.S., State University of New York College of Environmental Science and Forestry, 1975

JENIFER BREYER (1979), *Assistant to the President*; B.A., University of Northern Iowa, 1964; M.A., Indiana University, 1970

JEROME BREZNER (1961)*, *Professor*, Department of Environmental and Forest Biology; A.B., University of Rochester, 1952; A.M., University of Missouri, 1956; Ph.D., 1959

KENNETH W. BRITT, (1971), *Senior Research Associate*; B.S., Cornell University, 1929

ROBERT H. BROCK, JR. (1967)*, *Professor*, Department of Forest Engineering; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1958; M.S., 1959; Ph.D., Cornell University, 1971

RANIER H. BROCKE (1969)*, *Senior Research Associate*, Adirondack Ecological Center; B.S., Michigan State University, 1955; M.S., 1957; Ph.D., 1970

DAVID F. BRODOWSKI (1977), *Technical Assistant*, Department of Environmental and Forest Biology; B.S., Cornell University, 1975

ALTON F. BROWN (1963) *Technical Specialist*, Empire State Paper Research Institute

THOMAS E. BROWN (1977), *Adjunct Assistant Professor*, Department of Environmental and Forest Biology; B.S., Niagara University, 1957

KENNETH F. BURNS (1970), *Technical Assistant*, School of Forestry; A.A.S., Paul Smith's College, 1969

HARRY W. BURRY (1962), *Extension Specialist*, School of Forestry; *Associate Professor*; B.S., State University of New York College of Forestry, 1941; M.F., 1964

PAUL M. CALUWE (1969)*, *Senior Research Associate*, Department of Chemistry; M.S., University of Louvain, 1964; Ph.D., 1967

ROBERT CAMERON (1974), *Research Technician*, Adirondack Ecological Center; State University of New York College of Environmental Science and Forestry (Ranger School), 1973

WILBUR H. CAMPBELL (1975), *Assistant Professor*, Department of Chemistry; A.A., Santa Ana College, 1965; B.A., Pomona College, 1967; Ph.D., University of Wisconsin, 1972

HUGH O. CANHAM (1966)*, *Associate Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1960; M.S., 1962; Ph.D., 1971

DIANNE M. CAPRITTA (1967), *Associate Librarian*, F. Franklin Moon Library; B.S., University of Illinois, 1965; M.S.L.S., Syracuse University, 1967

RHONDDA K. CASSETTA (1967), *Associate for Institutional Research*, Office of the Vice President for Administration and Services; A.B., Elmira College, 1933

COSTAS A. CASSIOS (1978), *Adjunct Professor*, Landscape Architecture; B.S., University of Thessaloniki, 1965; M.S., Graduate Industrial School, 1969; M.S., University of Wisconsin, 1972; Ph.D., University of Wisconsin, 1976

JOHN D. CASTELLO (1978), *Assistant Professor*, Department of Environmental and Forest Biology; B.A., Montclair State College, 1973; M.S., Washington State University, 1975; Ph.D., University of Wisconsin, 1978

ROBERT E. CHAMBERS (1967)*, *Associate Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., Pennsylvania State University, 1954; M.S., 1956; Ph.D., Ohio State University, 1972

WILLIAM M. CHRISTIAN (1974), *Technical Assistant*, Department of Security and Safety

NEILS B. CHRISTIANSEN (1960)*, *Senior Research Associate*; B.S., University of Idaho, 1957; M.S., State University of New York College of Forestry, 1959; Ph.D., 1966

ROLLA W. COCHRAN (1964), *Assistant to the President for Community Relations*; Office of the President; *Associate Professor*; Coordinator of Demonstration and Information, Institute of Environmental Affairs; B.A., Denison University, 1949; M.S., Ohio State University, 1951

HARRY J. CORR (1967), *Director of Business and Fiscal Affairs*, Office of the Vice President for Administration and Services; B.S. Siena College, 1957

WILFRED A. COTE, JR. (1950)*, *Professor and Dean*, School of Environmental and Resource Engineering; *Director*, Nelson Cortlandt Brown Center for Ultrastructure Studies; B.S., University of Maine, 1949; M.F., Duke University, 1950; Ph.D., State University of New York College of Forestry, 1958

JAMES E. COUFAL (1965), *Director and Professor*, School of Forest Technology; State University of New York College of Forestry (Ranger School), 1957; B.S., State University of New York College of Forestry, 1960; M.S., 1962; Ed.S., State University of New York at Albany, 1976

PHILLIP J. CRAUL (1968)*, *Professor*, School of Forestry; B.S.F., Pennsylvania State University, 1954; M.S., 1960; Ph.D., 1964

JAMES O. CREVELLING (1970), *Forest Property Manager*, Department of Environmental and Forest Biology; A.A.S., Paul Smith's College, 1965; M.S., University of Massachusetts, 1967

CLAY M. CROSBY (1964), *Research Assistant*, Empire State Paper Research Institute; B.S., State University of New York College of Forestry, 1964; M.S., 1970

SHEILA M. CROWLEY (1977), *Assistant for Institutional Research; Director of Administrative Data Processing*, Office of the Vice President for Administration and Services; A.B., Albertus Magnus College, 1967

JUSTIN CULKOWSKI (1978), *Director of Alumni Affairs*, B.S., State University of New York College of Environmental Science and Forestry, 1973

TIBERIUS CUNIA (1968), *Professor*, School of Forestry; Graduate Program in Environmental Science; Forest Engineer, Ecole Nat. des Eaux et Forets, 1951; M.S., McGill University, 1957

GEORGE W. CURRY (1966)*, *Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.A., Michigan State University, 1962; B.S., 1965; M.L.A., University of Illinois, 1969

MIROSLAV M. CZAPOWSKYJ (1979), *Adjunct Professor*, School of Forestry

BENJAMIN V. DALL (1975)*, *Professor*, Graduate Program in Environmental Science; B.S., Yale University, 1955; M.F., 1956; J.D., University of Virginia, 1959; Ph.D., Pennsylvania State University, 1972

ROBERT W. DAVIDSON (1957)*, *Professor*, Department of Wood Products Engineering; *Director*, Tropical Timber Information Center; B.S., Montana State University, 1948; M.S., State University of New York College of Forestry, 1956; Ph.D., 1960

ARNOLD C. DAY (1969), *Technical Specialist*, Nelson Cortlandt Brown Center for Ultrastructure Studies

SALVACION DE LA PAZ (1973), *Associate Librarian*, F. Franklin Moon Library; B.S.L.S., University of the Philippines, 1956; M.S.L.S., Simmons College, 1962

CARLTON W. DENCE (1951)*, *Senior Research Associate*, Empire State Paper Research Institute; Graduate Program in Environmental Science; *Professor*, B.S., Syracuse University, 1947; M.S., State University of New York College of Forestry, 1949; Ph.D., 1959

CARL H. DE ZEEUW (1946)*, *Professor*, Department of Wood Products Engineering; A.B.,Michigan State College, 1934; B.S., 1937; M.S., State University of New York College of Forestry, 1939; Ph.D., 1949

ARTHUR G. DILLON (1976), *Technical Assistant*, Department of Paper Science and Engineering; B.S., State University of New York College of Environmental Science and Forestry, 1974

DANIEL L. DINDAL (1966)*, *Professor*, Department of Environmental and Forest Biology; B.S., Ohio State University, 1958; M.A., 1961; Ph.D., 1966; *Chancellor's Award for Excellence in Teaching* (1974)

MICHAEL J. DUGGIN (1979), *Associate Professor*, Department of Forest Engineering; B.Sc., Melbourne University, 1959; Ph.D., Monash University, 1965

GEORGE F. EARLE (1952)*, *Professor*, School of Landscape Architecture; B.F.A., Syracuse University, 1937; M.F.A., Yale University, 1946

RONALD EBY (1968), *Research Associate*; B.S., State University of New York College of Environmental Science and Forestry, 1969; M.S., 1972; Ph.D., 1974

DONALD EGGEN (1979), *Technical Specialist*, Office of the Assistant to the President for Special Projects; M.S., University of Michigan, 1978

ANDREW L. EGGERS (1967), *Technical Specialist*, Educational Communications Section, Office of the Vice President for Administration and Services

THOMAS ELIAS (1977), *Adjunct Associate Professor*, Department of Environmental and Forest Biology; B.A., Southern Illinois University, 1964; M.A., 1966; Ph.D., St. Louis University and the Missouri Botanical Garden, 1969

ELIZABETH A. ELKINS (1973), *Associate Librarian*, F. Franklin Moon Library; B.A., Hartwick College, 1968; M.L.S., State University of New York at Geneseo, 1970

JOHN H. ENGELKEN (1959), *Assistant Professor; Forest Property Manager*, Tully Campus; B.S.F., Utah State University, 1950

ARTHUR R. ESCHNER (1961)*, *Professor*, School of Forestry; B.S., State University of New York College of Forestry, 1950; M.S., Iowa State College, 1952; Ph.D., State University of New York College of Forestry, 1965

AMINUR EUSUFZAI (1977), *Technical Assistant*, Empire State Paper Research Institute; B.Sc. (Hons.), Decca University, 1957; M.Sc., Decca University, 1960; B.Sc. (Hons.), Beshawar University, 1962, M.S., West Virginia University, 1969

MILDRED FAUST (1976), *Adjunct Professor*, School of Biology, Chemistry and Ecology; A.B., Penn College, 1921; M.S., University of Chicago, 1923; Ph.D., University of Chicago, 1933

JOHN P. FELLEMAN (1973)*, *Associate Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.C.E., Cornell University, 1966; M.E.C., 1966; D.P.A., New York University, 1975

JEAN E. FISHER (1963), *Senior Research Associate*, School of Forestry; *Professor*; B.S., University of Idaho, 1941

JOHN S. FISHLOCK (1965), *Technical Assistant*, Department of Environmental and Forest Biology; State University of New York College of Forestry, 1965

MICHAEL FLASHNER (1973), *Associate Professor*, Department of Chemistry; B.S., Brooklyn College, 1965; A.M., University of Michigan, 1970; Ph.D., 1971

ESTELLE M. FONDY (1978), *Technical Assistant*, Computer Center; B.A., Syracuse University, 1976

CLAUDE C. FREEMAN (1959), *Associate Professor*, School of Landscape Architecture; B.S., State University of New York College of Forestry, 1959

ROBERT H. FREY (1977), *Assistant Vice President for Academic Programs, Associate Professor*, B.A., Valparaiso University, 1965; M.Ed., Springfield College, 1966; Ed.D., Indiana University, 1973

ROBERT L. FRIEDMAN (1967), *Director of Admissions*, Office of the Vice President for Student Affairs; A.B., Syracuse University, 1952; M.A., 1954

JAMES W. GEIS (1968)*, *Acting Assistant Vice President for Research Programs, Acting Director of the Institute of Environmental Program Affairs, Professor*, Department of Environmental and Forest Biology; B.S.F., University of Illinois, 1965; M.S., 1967; Ph.D., State University of New York College of Environmental Science and Forestry, 1972

RONALD J. GIEGERICH (1977), *Technical Assistant*, Department of Environmental and Forest Biology; A.A.S., State University of New York Agricultural and Technical College at Cobleskill, 1976

SERGE N. GORBATSEVICH (1956)*, *Associate Professor*, Department of Paper Science and Engineering; B.S., State University of New York College of Forestry, 1954; M.S., 1955

MORT GRANT (1976), *Adjunct Professor*, Institute of Environmental Program Affairs; B.A., Whitman College, 1946; M.B.A., University of Chicago, 1949; M.P.A., Harvard University, 1959

STEPHEN GRANZOW (1969), *Technical Specialist*, Empire State Paper Research Institute

MIKLOS A. J. GRATZER (1973)*, *Professor*, School of Forestry; Graduate Program in Environmental Science; Diploma for Forest Engineering, Sopron University, 1956; B.Sc., University of British Columbia, 1959; M.S.R.C., University of Montana, 1965; Ph.D., 1971

PAUL F. GRAVES (1947)*, *Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1939; M.F., 1941; Ph.D., Syracuse University, 1950

DAVID H. GRIFFIN (1968)*, *Associate Professor*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1959; M.A., University of California, 1960; Ph.D., 1963

JAMES P. HALLIGAN (1979), *Technical Assistant*, School of Forestry; B.A., State University of New York College of Environmental Science and Forestry, 1974

JUDITH C. HAMILTON (1979), *Financial Aids Advisor*, Financial Aids Office; B.S., State University College at Brockport, 1967; M.S., State University of New York at Albany, 1968

ALAN HANKIN (1978), *Associate for Continuing Education*, School of Continuing Education; B.A., Boston University, 1971; Teaching Certificate, University of New Hampshire, 1974

ROBERT B. HANNA (1977), *Assistant Director and Associate Professor*, Ultrastructure Lab; Graduate Program in Environmental Science; B.S., University of Michigan, 1967; M.S., State University of New York College of Environmental Science and Forestry, 1971; Ph.D., 1973

DAVID L. HANSELMAN (1963)*, *Professor*, Graduate Program in Environmental Science; B.S., Cornell University, 1957; M.S., 1958; Ph.D., Ohio State University, 1963

DAVID B. HARPER (1972), *Senior Research Associate*, School of Landscape Architecture; Graduate Program in Environmental Science; B.S., Bates College, 1959; M.R.P., University of Pennsylvania, 1969

ROY C. HARTENSTEIN (1959-65) (1967)*, *Professor*, Department of Environmental and Forest Biology; B.S., State Teachers College at Buffalo, 1953; M.S., Syracuse University, 1957; Ph.D., State University of New York College of Forestry, 1959

ALAN HARVEY (1977); *Technical Specialist*, Analytical and Technical Services

RICHARD HAWKS (1979), *Assistant Professor*, Landscape Architecture; B.L.A., State University of New York College of Environmental Science and Forestry, 1972; M.L.A., Harvard University, 1978

GORDON M. HEISLER (1973), *Adjunct Associate Professor*, School of Forestry; B.S., Pennsylvania State University, 1961; M.F., Yale University, 1962; Ph.D., State University of New York College of Forestry, 1970

ROBERT D. HENNIGAN (1967)*, *Director*, Graduate Program in Environmental Science; B.C.E., Manhattan College, 1949; M.A., Syracuse University, 1964

LEE P. HERRINGTON (1965)*, *Professor*, School of Forestry; B.S., University of Maine, 1959; M.F., Yale University, 1960; Ph.D., 1964

DEBORAH B. HILL (1979), *Visiting Assistant Professor*, School of Forestry, B.S., Tufts University, 1964; M.Ed., Boston University, 1968; M.F.S., Yale University, 1973; Ph.D., 1977

EDMUND HILLIARD (1978), *Adjunct Assistant Professor*, Institute for Environmental Program Affairs, B.L.A., State University of New York College of Environmental Science and Forestry, 1967

BERNARD T. HOLTMAN (1968), *TV/Motion Picture Producer-Director, Acting Director*, Educational Communications Section, Office of the Vice President for Administration and Services; B.A., Siena College, 1950; M.S., Syracuse University, 1972

PAUL F. HOPKINS (1979), *Assistant Professor*, Forest Engineering; B.S., University of Maine, 1977; M.S., State University of New York College of Environmental Science and Forestry, 1979

ALLEN F. HORN, JR. (1957)*, *Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., Michigan State University, 1950; M.S., 1951; Ph.D., State University of New York College of Forestry, 1957; L.L.B., Syracuse University, 1967

STEPHEN B. HORSLEY (1979), *Adjunct Assistant Professor*, Department of Environmental and Forest Biology; B.S., Pennsylvania State University, 1965; M.A., University of Massachusetts, 1968; Ph.D., 1970

JOEL R. HOWARD (1977), *Coordinator*, Summer Sessions in Field Forestry; *Instructor*, School of Forestry; State University of New York College of Forestry (Ranger School), 1966; Forest Property Manager, Warrensburg, 1979; B.S., State University of New York College of Environmental Science and Forestry, 1973; M.S., 1977

JOHN J. HOWARD (1978), *Adjunct Assistant Professor*, Department of Environmental and Forest Biology; B.A., Yale University, 1966; M.P.H., 1970; Ph.D., 1973

HIROSHI ITO (1976), *Research Associate*, Department of Chemistry; Ph.D., University of Tokyo, 1976

HUGO A. JAMNBACK (1973), *Adjunct Senior Research Associate*, Department of Environmental and Forest Biology; B.A., Boston University, 1949; M.A., University of Massachusetts, 1951; Ph.D., 1953

ROBERT V. JELINEK (1972)*, *Professor*, Department of Paper Science and Engineering; Graduate Program in Environmental Science; B.S., Columbia University, 1945; M.S., 1947; Ph.D., 1953

HAZEL S. JENNISON (1965), *Research Assistant*, Analytical and Technical Services, Office of the Vice President for Administration and Services; B.S., Western Kentucky State College, 1941; M.S., Syracuse University, 1966

DAVID L. JOHNSON (1975), *Assistant Professor*, Department of Chemistry; Graduate Program in Environmental Science; B.S., Antioch College, 1965; Ph.D., University of Rhode Island, 1973

WILLIAM L. JOHNSON (1974), *Technical Specialist*, Department of Forest Engineering; B.S., University of Wisconsin, 1972; M.S., 1974

DAVID F. KARNOSKY (1977); *Adjunct Assistant Professor*, Department of Environmental and Forest Biology; B.S., University of Wisconsin, 1971; M.S., 1972; Ph.D., 1975

RONALD R. KARNS (1965), *Editorial Associate*, Office of Publications; B.S., Ohio State University, 1954

ROWENA V. KATHER (1974), *Assistant to the Director*, Analytical and Technical Services, Office of the Vice President for Administration and Services

CLEMENS M. KAUFMAN (1979), *Professor*, Yezin, Burma; Ph.D., University of Minnesota, 1943

EDWIN H. KETCHLEDGE (1955)*, *Distinguished Teaching Professor*, Department of Environmental and Forest Biology; *Director*, Cranberry Lake Biological Station; *Forest Manager*, Pack Demonstration Forest, Cranberry Lake Campus; B.S., State University of New York College of Forestry, 1949; M.S., 1950; Ph.D., Stanford University, 1957

LEE E. KOPPELMAN (1975)*, *Adjunct Professor*, Graduate Program in Environmental Science; B.E., City College of New York, 1950; M.S., Pratt Institute Graduate School of Architecture, 1962; D.P.A., New York University, 1970

DONALD E. KOTEN (1961)*, *Associate Professor*, School of Forestry; B.A., North Central College, 1951; B.S., Oregon State College, 1957; Ph.D., State University of New York College of Forestry, 1966

STELLA D. KROFT (1973), *Technical Assistant*, F. Franklin Moon Library

FRANK E. KURCZEWSKI (1966)*, *Professor*, Department of Environmental and Forest Biology; B.S., Allegheny College, 1958; M.S., Cornell University, 1962; Ph.D., 1964

GEORGE H. KYANKA (1967)*, *Chairman and Associate Professor*, Department of Wood Products Engineering; B.S., Syracuse University, 1962; M.S., 1966; *Chancellor's Award for Excellence in Teaching* (1973); Ph.D., 1976

ROBERT T. LALONDE (1959)*,*Professor*, Department of Chemistry; B.A., St. John's University, 1953; Ph.D., University of Colorado, 1957

JUDITH A. LAMANNA (1973), *Assistant to the Vice President*; Office of the Vice President for Administration and Services; A.A.S., Onondaga Community College, 1969; B.A., LeMoyne College, 1971; M.P.A., Syracuse University, 1976

GERALD N. LANIER (1970)*, *Professor*, Department of Environmental and Forest Biology; B.S., University of California, 1960; M.S., 1965; Ph.D., 1967

RONALD F. LAPLAINE (1963), *Technical Specialist*, Department of Paper Science and Engineering

CHARLES C. LARSON (1950)*, *Professor*, School of Forestry; A.S., North Dakota State School of Forestry, 1938; B.S., University of Minnesota, 1940; M.S., University of Vermont, 1943; Ph.D., State University of New York College of Forestry, 1952

RICHARD V. LEA (1946-56) (1967)*, *Associate Professor*, School of Forestry; B.S., State University of New York College of Forestry, 1946; M.S., 1948; Ph.D., 1953

ALBERT L. LEAF (1957)*, *Professor*, School of Forestry; B.S.F., University of Washington, 1950; M.S., 1952; Ph.D., University of Wisconsin, 1957

CHARLES N. LEE (1959)*, *Director*, Computer Services; *Professor*, Department of Forest Engineering; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1949; B.C.E., Syracuse University, 1957; M.C.E., 1959

RAYMOND E. LEONARD (1964)*, *Adjunct Professor*, Institute of Environmental Program Affairs; B.S., University of Vermont, 1955; M.M.M., University of Helsinki, 1957; M.F., Yale University, 1964; Ph.D., State University of New York College of Forestry, 1967

BENGT LEOPOLD (1961)*, *Professor and Chairman*, Department of Paper Science and Engineering; *Director*, Empire State Paper Research Institute; B.Sc., Royal Institute of Technology, Stockholm, 1947; Licentiat, 1949; Ph.D., 1952

GIDEON LEVIN (1972), *Associate Professor*, Polymer Research Institute; B.S., Technion, Israel Institute of Technology, 1960; M.S., Purdue University, 1965; Ph.D., State University of New York College of Forestry, 1971

ALLEN R. LEWIS (1970)*, *Associate Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.A., University of Oklahoma, 1959; M.C.P., University of California (Berkeley), 1961; *Executive Chairman of the Faculty* (1978)

ROBERT C. LOOMIS (1974), *Manager*, Computer Center; B.S., Wheaton College, 1949; M.A., Columbia University, 1952

PHILIP LUNER (1957)*, *Senior Research Associate*, Empire State Paper Research Institute; *Professor*, Graduate Program in Environmental Science; B.Sc., University of Montreal (Loyola College), 1947; Ph.D., McGill University, 1951

EDWARD M. LUNK (1978), *Instructor*, School of Forest Technology, B.S., University of Michigan, 1971; B.S.E., 1976; M.S. 1975

J. DONALD MABIE (1967), *Coordinator for Sponsored Programs*, Office of the Vice President for Program Affairs; B.S., State University of New York at Albany, 1961

CHARLES C. MADDISON (1977), *Technical Assistant*, Adirondack Ecological Center

WALTER A. MAIER (1966), *Technical Specialist*, Department of Wood Products Engineering; B.S., State University of New York College of Forestry, 1960

PAUL D. MANION (1967)*, *Professor*, Department of Environmental and Forest Biology; B.S., University of Minnesota, 1962; M.S., 1965; Ph.D., 1967

MARY ANNE T. MARANO (1972), *Bursar*, Office of the Vice President for Administration and Services; A.A., Onondaga Community College, 1967

FRANK L. MARAVIGLIA (1964), *Associate Professor*, School of Landscape Architecture; B.S., State University of New York College at Oswego, 1958; M.S., Hofstra University, 1963

RICHARD E. MARK (1970)*, *Senior Research Associate*, Empire State Paper Research Institute; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1950; M.S., Yale University, 1960; Ph.D., 1965

RAYMOND L. MARLER (1970), *Senior Research Associate*; B.S., University of Michigan, 1948; M.F., 1948

DAVID A. MARQUIS (1979), *Adjunct Professor*, School of Forestry; B.S., Pennsylvania State University, 1955; M.S., Yale University, 1963; Ph.D., 1973

CHARLES E. MARTIN II (1962), *Professor*, School of Forest Technology; B.S., Duke University, 1953; M.F., 1954

RENATA MARTON (1957)*, *Senior Research Associate*, Empire State Paper Research Institute; *Professor*; Master Ph. (Chemistry), Jagiello University, 1934; Ph.D., 1936

RAYMOND MASTERS (1968), *Technical Assistant*, Newcomb Campus

GEORGE F. MATTFELD (1965) (1978), *Adjunct Associate Professor*, Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1962; M.S., University of Michigan, 1964; Ph.D., State University of New York College of Environmental Science and Forestry, 1974

RICHARD MCCLIMANS (1977), *Senior Research Associate*, Department of Forest Engineering; B.S., Merrimack College, 1961

JAMES P. MCKENNA (1979), *Assistant Professor*, Wood Products Engineering; B.S., State of New York College of Environmental Science and Forestry, 1977; M.S., 1979

JOHN J. MCKEON (1979), *Technical Specialist*, Nelson Cortlandt Brown Center for Ultrastructure Studies

DONALD G. MCLEAN (1968), *Programmer Analyst*, Computer Center

THOMAS O. MEHEN (1979), *Executive Director*, Syracuse Pulp and Paper Foundation and Forestry Foundation; B.S., Arizona State University, 1960

VINEETA MEHRA (1979), *Visiting Assistant Professor*, Landscape Architecture

JOHN A. MEYER (1958)*, *Director*, Analytical and Technical Services, Office of the Vice President for Administration and Services; *Senior Research Associate and Professor*, Department of Chemistry; Graduate Program in Environmental Science; B.S., Pennsylvania State College, 1949; M.S., 1950; Ph.D., State University of New York College of Forestry, 1958; *Chancellor's Award for Excellence in Professional Service* (1977)

ROBERT W. MEYER (1979), *Associate Professor*, Wood Products Engineering; B.S.F., University of Washington, 1962; M.F., 1964; Ph.D., State of New York College of Environmental Science and Forestry, 1967

HOWARD C. MILLER (1950), *Extension Specialist and Professor*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1941; Ph.D., Cornell University, 1951

RICHARD W. MILLER (1966), *Assistant Professor*, School of Forest Technology; State University of New York College of Forestry (Ranger School), 1953; B.S., State University of New York College of Forestry, 1956

MYRON J. MITCHELL (1975), *Associate Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.A., Lake Forest College, 1969; Ph.D., University of Calgany, 1974

ALFRED V. MOLLITOR, JR. (1976), *Technical Assistant*, Department of Environmental and Forest Biology; B.S., State University of New York College of Environmental Science and Forestry, 1976

DOUGLAS B. MONTEITH (1977), *Senior Research Associate*, School of Forestry; B.S., University of Maine, 1965; M.S., University of Maine, 1967

RAYMOND A. MOORE (1954)*, *Associate Professor*, Department of Wood Products Engineering; B.S.F., West Virginia University, 1951; M.S., North Carolina State College, 1952

CHARLIE D. MORRIS (1972)*, *Adjunct Associate Professor*, Department of Environmental and Forest Biology; B..S., Ohio University, 1963; M.S., University of Wisconsin, 1967; Ph.D., 1969

JACQUELYN M. MORRIS (1972), *Associate Librarian*, F. Franklin Moon Library; A.B., Syracuse University, 1971; M.S.L.S., 1972; *Chancellor's Award for Excellence in Librarianship* (1977)

DOUGLAS A. MORRISON (1969)*, *Research Associate*; Graduate Program in Environmental Science; B.A., University of Western Ontario, 1966; M.S., University of Oregon, 1967; Ph.D., 1969

DIETLAND MULLER-SCHWARZE (1973)*, *Professor*, Department of Environmental and Forest Biology; Doctorate, Max Planck Institute, 1958-1960; Ph.D., University of Freiburg, 1963

EDWARD J. MULLIGAN (1968), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services

ROBERT MULLIGAN (1976), *Technical Assistant*, Department of Environmental and Forest Biology; B.S., State University of New York College of Environmental Science and Forestry, 1976

JAMES P. NAKAS (1979), *Assistant Professor*, Environmental and Forest Biology; B.S., LeMoyne College, 1968; M.S., Seton Hall University, 1970; Ph.D., Rutgers University, 1976

TSUTOMU NAKATSUGAWA (1968)*, *Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B. Agric., Tokyo University, 1957; M.S., Iowa State University, 1961; Ph.D., 1964

ANTHONY J. NAPPI (1975), *Adjunct Associate Professor*, Department of Environmental and Forest Biology; B.S., Central Connecticut State, 1959; M.S., 1964; Ph.D., University of Connecticut, 1968

EDWARD NEUHAUSER (1976), *Technical Assistant*, Department of Environmental and Forest Biology; B.S., State University of New York College of Environmental Science and Forestry, 1973

LINDA NEWELL (1978), *Technical Assistant*, Landscape Architecture

ROGER L. NISSEN, JR. (1971), *Technical Assistant*, School of Forestry; A.A.S., Paul Smith's College, 1970

ROBERT S. NORTH (1975), *Registrar*, Office of the Vice President for Student Affairs; A.B., Syracuse University, 1952

DIANE NORTHRUP (1978), *Technical Assistant*, School of Forest Technology; A.A.S., State University of New York College of Environmental Science and Forestry (Ranger School), 1978

ROY A. NORTON (1970), *Research Associate*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1969; M.S., 1973; Ph.D., 1977

JOHN D. NOVADO (1967), *Editorial Associate*, Office of Publications; B.A., Syracuse University, 1965

RALPH D. NYLAND (1967), *Associate Professor*, School of Forestry; B.S., State University of New York College of Forestry, 1958; M.S., 1959; Ph.D., Michigan State University, 1966

SHEILA O'ROURKE (1979), *Assistant to the Vice President for Student Affairs*, Office of Student Affairs; A.A., Cape Cod Community College, 1974; B.A., University of Massachusetts, 1976; M.Ed., Suffolk University, 1979

DAVID E. OSTERBERG (1974), *Technical Assistant*, Adirondack Ecological Center, A.A.S., Paul Smith's College, 1973

DONALD A. PAFKA (1967), *Technical Assistant*, School of Forestry; A.A.S., State University of New York Agricultural and Technical College at Morrisville, 1956; State University of New York College of Forestry (Ranger School), 1966

CARL E. PALM, JR. (1972), *Technical Assistant*, A.A.S., Paul Smith's, 1972

DAVID G. PALMER (1966), *Associate Professor*, Department of Forest Engineering; Graduate Program in Environmental Science; B.S., General Motors Institute, 1962; M.S., Syracuse University, 1964; Ph.D., 1975

EDWARD E. PALMER (1969), *President*; A.B., Middlebury College, 1939; Ph.D., Syracuse University, 1949

BEVERLY B. PARKS (1979), *Personnel Associate for Employment Services*, Office of the Vice President for Administration and Services, B.S., Empire State College, 1977

BRUCE PATTERSON (1978), *Technical Assistant*, Computer Center; B.A., State University of New York at Oswego, 1974

THOMAS A. PAULO (1974), *Associate Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; A.B., New York University, 1968; J.D., 1971; M.L.A., State University of New York College of Environmental Science and Forestry, 1974

HARRISON H. PAYNE (1964), *Vice President for Student Affairs; Professor*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1950; M. Ed., St. Lawrence University, 1955; Ed. D., Cornell University, 1963

TIMOTHY PEPPER (1978), *Technical Assistant*, Polymer Research Center; B.S., State University of New York College of Environmental Science and Forestry, 1978

JANIS PETRICEKS (1968)*, *Professor*, School of Forestry; University of Freiburg, 1950; M. Agr., Interamerican Institute of Agricultural Sciences, 1956; Ph.D., State University of New York College of Forestry, 1968

GUY PIROLLA (1979), *Technical Assistant*, Department of Chemistry, B.S., State of New York College of Environmental Science and Forestry, 1963

PATRICIA K. BARON POLLAK (1973), *Associate Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.A., Carnegie Mellon University, 1967; M.R.P., Syracuse University, 1972; M.A., Tufts University, 1974; Ph.D., Syracuse University, 1975

JACOBUS B. POOT (1968), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services

WILLIAM F. PORTER (1978), *Assistant Professor*, Environmental and Forest Biology; Graduate Program in Environmental Science; B.A., University of Northern Iowa, 1973; M.S., University of Minneapolis, 1978

DONALD POTTS (1978), *Research Associate*; B.A., State University of New York at Buffalo, 1972; M.S., State University of New York College of Environmental Science and Forestry, 1976; Ph.D., 1978

DUDLEY J. RAYNAL (1974), *Associate Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., Clemson University, 1969; Ph.D., University of Illinois, 1974

THOMAS B. REAGAN (1971), *Television Engineer*, Educational Communications Section, Office of the Vice President for Administration and Services

BRUCE E. REICHEL (1974), *Director of Physical Plant*, Office of the Vice President for Administration and Services; B.S., State University of New York College of Environmental Science and Forestry, 1972

ROBERT G. REIMANN (1962)*, *Professor and Dean*, School of Landscape Architecture; B.S., State University of New York College of Forestry, 1954

KERMIT E. REMELE (1962), *Associate Professor*, School of Forest Technology; State University of New York College of Forestry (Ranger School), 1943; B.S., State University of New York College of Forestry, 1949; M.F., University of Michigan, 1952

NORMAN A. RICHARDS (1963)*, *Professor*, School of Forestry; B.S., State University of New York College of Forestry, 1957; M.S., Cornell University, 1959; Ph.D., State University of New York College of Forestry, 1968

NEIL H. RINGLER (1975), *Associate Professor*, Department of Environmental and Forest Biology; B.S., California State University at Long Beach, 1967; M.S., Oregon State University, 1970; Ph.D., University of Michigan, 1975

JOHN K. ROBERTSON (1978), *Adjunct Associate Professor*, Graduate Program in Environmental Science; B.S., City College of New York, 1966; M.B.A., Long Island University, 1976; M.S., University of Chicago, 1968; Ph.D., 1970

JOHN R. ROMAN (1977), *Technical Specialist*, Department of Environmental and Forest Biology; B.S., Vanderbilt University, 1973

JANET ROMBOUGH (1978), *Technical Assistant*, Landscape Architecture; B.A., State University of New York at Albany, 1978

KATHERINE P. ROSSI (1966), *Associate Librarian*, F. Franklin Moon Library; B.A., William Smith College, 1945; M.S.L.S., Syracuse University, 1966

SAMUEL ROTHENBERG (1946), *Research Associate*, Empire State Paper Research Institute; B.S., State University of New York College of Forestry, 1943; M.S., 1964

ROWAN A. ROWNTREE (1977) *Adjunct Associate Professor*, Graduate Program in Environmental Science; B.A. (hons.) California State University, 1966; M.S., University of California, Berkeley, 1970; Ph.D., 1973

RICHARD W. SAGE, JR. (1970), *Research Assistant and Property Forester*, Adirondack Ecological Center; B.S., State University of New York College of Forestry, 1966

ANATOLE SARKO (1967)*, *Professor*, Department of Chemistry; B.S., Upsala College, 1952; M.S., New York University, 1961; Ph.D., State University of New York College of Forestry, 1966

MICHAIL SCHAEDLE (1965)*, *Associate Professor*, Department of Environmental and Forest Biology; B.S., University of British Columbia, 1957; M.S., 1959; Ph.D., University of California, 1964

DANIEL E. SCHIFFHAUER (1979), *Technical Assistant*, Department of Environmental and Forest Biology; B.S., State University of New York College of Environmental Science and Forestry, 1978

CONRAD SCHUERCH (1949)*, *Distinguished Professor*, Department of Chemistry; B.S., Massachusetts Institute of Technology, 1940; Ph.D., 1947

RICHARD A. SCHWAB (1976), *Assistant Director of Physical Plant*, Office of the Vice President for Administration and Services; B.S., State University of New York College of Environmental Science and Forestry, 1969

DORENE L. SETLIFF (1978), *Technical Assistant*, Department of Environmental and Forest Biology; M.S., State University of New York at Buffalo, 1963, Ph.D., State University of New York College of Environmental Science and Forestry, 1971

WILLIAM SHIELDS (1979), *Assistant Professor*, Department of Environmental and Forest Biology; A.B., Rutgers University, 1974; M.S., Ohio State University, 1976

JOHN F. SIAU (1963-64) (1965) (1966)*, *Professor*, Department of Wood Products Engineering; B.S., Michigan State University, 1943; M.S., State University of New York College of Forestry, 1965; Ph.D., 1968

ROBERT M. SILVERSTEIN (1969)*, *Professor*, Department of Chemistry; B.S., University of Pennsylvania, 1937; M.S., New York University, 1941; Ph.D., 1949

JOHN B. SIMEONE (1948)*, *Professor and Chairman*, Department of Environmental and Forest Biology; B.S., Rhode Island State College, 1942; M.F., Yale University, 1948; Ph.D., Cornell University, 1960

RONALD J. SLOAN (1973), *Research Associate*, Department of Environmental and Forest Biology; B.S., Oregon State University, 1966; Ph.D., State University of New York College of Environmental Science and Forestry, 1973

THOMAS O. SLOCUM (1977), *Coordinator of Career Services*, Office of the Vice President for Student Affairs; B.S., State University of New York at Brockport, 1967; M.S., State University of New York at Albany, 1968

RICHARD C. SMARDON (1979), *Research Associate*, School of Landscape Architecture; B.S., University of Massachusetts 1970; M.S., 1973

JOHANNES SMID (1956-57) (1960)*, *Professor*, Department of Chemistry; B.Sc., Free University, 1952; M.Sc., 1954; Ph.D., State University of New York College of Forestry, 1957

JERI LYNN SMITH (1977), *Editorial Associate*, Community Relations; B.A., Syracuse University, 1975

KENNETH J. SMITH, JR. (1968)*, *Professor and Chairman*, Department of Chemistry; Graduate Program in Environmental Science; *Acting Director*, Polymer Research Institute; B.A., East Carolina College, 1957; M.A., Duke University, 1959; Ph.D., 1962

LEONARD A. SMITH (1964), *Assistant Professor*, Department of Wood Products Engineering; B.S., Ch.E., University of Dayton, 1962; M.S., Ch.E., Case Institute of Technology, 1964; Ph.D., State University of New York College of Environmental Science and Forestry, 1972

ROBERT P. SMITH (1969), *Technical Specialist*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1970

GEORGE A. SNYDER (1970), *College Photographer*, Educational Communications Section, Office of the Vice President for Administration and Services

FRANCIS M. SOLAN (1974), *Technical Assistant*, School of Forestry; A.A.S., State University of New York at Morrisville, 1971

BRIAN M. SPEER (1977), *Director of Campus Security*, Office of the Vice President for Administration and Services; A.A.S., Mohawk Valley Community College, 1975

THEODORE J. STENUF (1960)*, *Distinguished Teaching Professor*, Department of Paper Science and Engineering; B.Ch.E., Syracuse University, 1949; M.Ch.E., 1951; Ph.D., 1953

JOHN J. STERBENZ (1973), *Assistant Professor*, School of Forest Technology; State University of New York College of Forestry (Ranger School), 1966; B.S., University of Michigan, 1970; M.S., 1972

JEANNETTE A. STETS (1979), *Assistant Professor*, School of Landscape Architecture; B.S.L.A., Ohio State University, 1976; M.L.A., University of Illinois, 1978

WILLIAM M. STITELER (1973)*, *Professor*, Graduate Program, in Environmental Science; B.S., Pennsylvania State University, 1964; M.S., 1965; Ph.D., 1970

DENNIS O. STRATTON (1978), *Associate Director of Admissions*, Admissions Office; B.S., State University of New York at Cortland, 1966; M.S., 1967

WESLEY E. SUHR (1974), *Associate Professor*, School of Forest Technology; B.S., University of Minnesota, 1958; M.S., University of Arizona, 1965

DANIEL SUNDQUIST (1979), *Assistant Professor*, Landscape Architecture, B.L.A., State University of New York College of Environmental Science and Forestry, 1970

ANDREW A. SWIGAR (1972), *Research Associate*, Department of Chemistry; B.S., University of Michigan, 1956; M.S., Purdue University, 1958; Ph.D., State University of New York College of Environmental Science and Forestry, 1972

PAUL SZEMKOW (1978), *Technical Assistant*, Department of Paper Science and Engineering; B.S., Empire State College, 1976

DAVID W. TABER (1970), *Adjunct Extensions Specialist*, B.S., University of Maine, 1961; M.S., 1968

STUART W. TANENBAUM (1973)*, *Professor and Dean*, School of Biology, Chemistry and Ecology; B.S., City College of New York, 1944; Ph.D., Columbia University, 1951

HERBERT B. TEPPER (1962)*, *Professor*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1953; M.S., 1958; Ph.D., University of California, 1962

ROGER C. THOMPSON (1975), *Adjunct Professor*, Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1951; M.S., Syracuse University, 1952; Ph.D., State University of New York College of Forestry, 1961

JAMES L. THORPE (1965), *Research Associate*, Empire State Paper Research Institute; B.S., State University of New York College of Forestry, 1965; M.S., 1967

WILLIAM C. TIERSON (1961)*, *Director*, Adirondack Ecological Center; B.S., State University of New York College of Forestry, 1949; M.F., 1967

TORE E. TIMELL (1962)*, *Professor*, Department of Chemistry; *Director*, Cellulose Research Institute; Civiling., Royal Institute of Technology, Stockholm, 1946; Tekn. lic., 1948; Ph.D., 1950

VIRGINIA TORELLI (1975), *Adjunct Foreign Student Counselor*, Office of the Vice President for Student Affairs; B.A., Syracuse University, 1944

R. GARY TREGASKIS (1969), *Technical Specialist*, Educational Communications Section, Office of the Vice President for Administration and Services; A.A.S., Broome Technical Community College, 1967

WILLIAM P. TULLY (1966)*, *Professor and Chairman*, Department of Forest Engineering; Graduate Program in Environmental Science; B.S., Northeastern University, 1964; M.S., 1966

LESLIE L. TURAI (1976)*, *Professor*, Department of Paper Science and Engineering; Graduate Program in Environmental Science; B.S., University of Debrecen, 1936; M.S., 1937; Ph.D., University of Budapest, 1938

WILLIAM E. TYSON (1975), *Adjunct Lecturer*, Institute of Environmental Program Affairs; B.S., Florida State University, 1959; M.S., 1960

JOHN E. UNBEHEND (1972), *Research Assistant*, Empire State Paper Research Institute; A.A.S., Onondaga Community College, 1966; B.S., State University of New York College of Forestry, 1969; M.S., 1975

SAMUEL UVA,(1979), *Visiting Assistant Professor*, Office of Program Affairs; B.S., LeMoyne College, 1961; M.S., Boston Collegé, 1964; Ph.D., 1968

FREDRICK A. VALENTINE (1956)*, *Professor*, Department of Environmental and Forest Biology; B.S., St. Cloud State Teachers College, 1949; M.S., University of Wisconsin, 1953; Ph.D., 1957

LARRY W. VAN DRUFF (1970)*, *Associate Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., Mansfield College, 1964; M.S., Cornell University, 1966; Ph.D., 1970

RAMESH C. VASISHTH (1975), *Adjunct Professor*, Department of Wood Products Engineering; Ph.D., University of Washington, 1960

DONNA C. VAVONESE (1978), *Assistant Director of Admissions*, Admissions Office; B.S., State University of New York at Oswego, 1971

H. FREDERICK VERNAY (1975), *Research Assistant*, Department of Chemistry; B.A., Lehigh University, 1968

JOHN E. VIEW (1979), *Director of Financial Aids*, Office of the Vice President for Student Affairs; B.A., St. Leo College, 1972; M.A., University of Notre Dame, 1974

DANIEL C. WALTON (1963)*, *Professor*, Department of Environmental and Forest Biology; B.Ch.E., University of Delaware, 1955; Ph.D., State University of New York College of Forestry, 1962.

CHUN-JUAN WANG (1959)*, *Professor*, Department of Environmental and Forest Biology; B.S. Taiwan University, 1950; M.S., Vassar College, 1953; Ph.D., State University of Iowa, 1955

DONALD F. WEBSTER (1973), *Librarian*, F. Franklin Moon Library; B.A., Hofstra University, 1959; M.L.S., Queens College, 1965

JOHN A. WEEKS (1977), *Adjunct Professor*, School of Forestry; B.S., Cornell University, 1949; M.S., Syracuse University, 1959

ROBERT G. WERNER (1966-69) (1970)*, *Professor*, Department of Environmental and Forest Biology; B.S., Purdue University, 1958; M.A., University of California, 1963; Ph.D., Indiana University, 1966

JANET R. WEST (1972), *Technical Assistant*, Department of Chemistry; B.S., State University of New York at Oswego, 1965

ROBERT D. WESTFALL (1972), *Research Associate*, School of Forestry; B.S., Michigan State University, 1967; Ph.D., 1972

LAWRENCE W. WHELPTON (1969), *Technical Specialist*, Department of Environmental and Forest Biology; A.A.S., State University of New York Agricultural and Technical College at Alfred, 1965

HUGH E. WILCOX (1951)*, *Professor*, Department of Environmental and Forest Biology; B.S., University of California, 1938; M.S., State University of New York College of Forestry, 1940; Ph.D., University of California, 1950

DAVID E. WILKINS (1966), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services

PETER F. WILTSIE (1968), *Assistant Director of Business and Fiscal Affairs*, Office of the Vice President for Administration and Services; A.B., Utica College of Syracuse University, 1965

JUDITH WOLFE (1977), *Technical Assistant*, U.S. Forest Service; B.S., State University of New York College of Environmental Science and Forestry, 1976

CHUN FOOK WONG (1971), *Research Associate*, Department of Chemistry; B.S., Nenyang University, Singapore, 1959; M.S., University of Berkeley, 1963; Ph.D., 1968

MARILYN L. WRIGHT (1974), *Assistant to the Director of Financial Aids*, Office of the Vice President for Student Affairs

JOHN M. YAVORSKY (1948-56) (1967)*, *Professor and Dean*, School of Continuing Education; B.S., State University of New York College of Forestry, 1942; M.S., 1947; Ph.D., 1955

ROBERT A. ZABEL (1947)*, *Professor*, Department of Environmental and Forest Biology; B.S., University of Minnesota, 1938; M.S., State University of New York College of Forestry, 1941; Ph.D., 1948

ALTON W. ZANDERS (1974), *Affirmative Action Officer*, Office of the Vice President for Administration and Services; *Director*, Educational Opportunity Program; B.S., Southern University (Baton Rouge, Louisiana), 1965; M.S., Syracuse University, 1970; J.D., 1974

EMERITUS

ERIC A. ANDERSON (1950-1975), *Professor Emeritus*; B.Sc.F., University of Washington, 1932; Ph.D., State University of New York College of Forestry, 1949

LAWRENCE J. BELANGER (1947-1965), *Registrar Emeritus*; *Professor Emeritus*; B.S., Syracuse University, 1932; M.S., New York State College for Teachers, Albany, 1941

C. ALLEN BICKFORD (1963-1972), *Professor Emeritus*; B.S., University of Idaho, 1925; M.S., Dartmouth College, 1931

ALFRED H. BISHOP (1942-1975), *Professor Emeritus*; B.S., New York State College of Forestry, 1929; M.F., 1931

FLOYD E. CARLSON (1930-1969), *Professor Emeritus*; B.S.F., University of Washington, 1928; M.F., 1930

DANIEL M. CASTAGNOZZI (1956-1977), *Professor and Director Emeritus*; A.A.S., State University of New York College of Forestry (Ranger School), 1950; B.S.F., University of Michigan, 1952; M.F., State University of New York College of Forestry, 1957

RAYMOND F. CROSSMAN (1942-19678), *Dean of Students Emeritus*; *Professor Emeritus*; B.A. Syracuse University, 1926; M.A., 1931

JAMES E. DAVIS (1947-1965), *Professor Emeritus*; B.S., Cornell University, 1924; M.F., 1926

RUSSELL C. DECKERT (1952-1976), *Professor Emeritus*; B.S.F., University of Georgia, 1938; M.F., Duke University, 1943

JAMES F. DUBUAR (1919-1957), *Director Emeritus, Ranger School; Professor Emeritus;* A.B., University of Michigan, 1913; M.S.F., 1915

C. EUGENE FARNSWORTH (1930-1972), *Professor Emeritus;* B.S.F., Iowa State College, 1926; M.F., Yale University, 1928; Ph.D., University of Michigan, 1945

CARL C. FORSAITH (1917-1959), *Professor Emeritus*; B.A., Dartmouth College, 1913; M.A.,Harvard University, 1914; Ph.D., 1917

RUSSELL E. GETTY (1966-1973), *Professor Emeritus*; B.S., Iowa State College, 1936; M.S., 1951

DONALD F. GREEN (1965-1978), *Registrar Emeritus*; A.B., New York State College for Teachers, Albany, 1942; M.S., 1950

GEORGE H. HAINES (1953-1968), *Director of Business Affairs Emeritus*; B.S., University of Rhode Island, 1932

WILLIAM M. HARLOW (1928-1965), *Professor Emeritus*; B.S., New York State College of Forestry, 1925; M.S., 1926; Ph.D. 1928

RAY R. HIRT (1921-1959), *Senior Professor Emeritus*; B.S., Hamline University, 1917; M.S., New York State College of Forestry, 1924; PnD., 1928

RAYMOND J. HOYLE (1918-1957), *Professor Emeritus*; B.S., New York State College of Forestry, 1917; M.S., Syracuse University, 1930

EDWIN C. JAHN (1938-1972), *Dean Emeritus*; *Professor Emeritus*; B.S., New York State College of Forestry, 1925; M.S., 1926; Ph.D., McGill University, 1929

THEODORE J. KOCHANEK (1971-1976), *Director of Physical Plant Emeritus*

RICHARD W. LALOR (1953-1976), *Associate Professor Emeritus*; B.S., New York State College for Teachers, 1941; A.M., Cornell University, 1946

ORRIN L. LATHAM (1930-1966), *Associate Professor Emeritus*; B.S.F., Iowa State College, 1927; Yale University, 1932

JOSIAH L. LOWE (1933-1975), *Professor Emeritus*; B.S., New York State College of Forestry, 1927; Ph.D., University of Michigan, 1938

AUBREY H. MACANDREWS (1926-1962), *Professor Emeritus*; Truro Agriculture College, 1922; B.S., New York State College of Forestry, 1925; M.S., 1926

JOHN L. MORRISON (1946-1971), *Professor Emeritus*; A.B., University of Nebraska, 1933; A.M., 1935; Ph.D., University of California, 1941

FREDERIC W. O'NEIL (1937-1974), *Professor Emeritus*; B.S., New York State College of Forestry, 1933; M.S., 1935

RICHARD E. PENTONEY (1953-1979), *Vice President for Program Affairs Emeritus*; B.S., University of California, 1949; M.S., State University of New York College of Forestry, 1952; Ph.D., 1956

LUCIAN P. PLUMLEY (1936-1967), *Director Emeritus*, Ranger School; *Professor Emeritus*; New York State College of Forestry, (Ranger School), 1931; B.S.,New York State College of Forestry, 1935

SHELLEY W. POTTER, JR. (1956-1979), *Forest Property Manager Emeritus*; B.S., University of Michigan, 1951

BRADFORD G. SEARS (1941-1976), *Dean Emeritus*; *Professor Emeritus*; B.S., New York State College of Forestry, 1939; M.S., 1948

HARDY L. SHIRLEY (1945-1967), *Dean Emeritus*; *Professor Emeritus*; B.A., Indiana University, 1922; Ph.D., Yale University, 1928; D.h.c., University of Helsinki, 1958; D.Sc., Syracuse University, 1966

SAVEL B. SILVERBORG (1947-1977)*, *Professor Emeritus*; B.S., University of Idaho, 1936; Ph.D., 1968

CHRISTEN SKAAR (1946-1948) (1949-1976)*, *Professor Emeritus*; B.S., New York State College of Forestry, 1943; M.S., 1948; Ph.D., Yale University, 1957

GERALD H. SMITH (1946-1979), *Professor Emeritus*; B.S., New York State College of Forestry, 1937; M.B.A., Syracuse University, 1956

LEROY C. STEGEMAN (1929-1965), *Professor Emeritus*; B.S., Michigan State College, 1928; M.S., University of Michigan, 1929

VIVIAN R. SUTTON (1962-1976), *Associate Professor Emeritus*; B.A., Oberlin College, 1934; M.A., Bryn Mawr College, 1937; Ph.D., 1942

MICHAEL M. SZWARC (1952-1979), *Leading Professor Emeritus*; Ch.E., Warsaw Polytechnic College, 932; Ph.D., Hebrew University, 1945; Ph.D., Manchester University, 1947; D.Sc., 1949

RALPH G. UNGER (1937-1964), *Professor Emeritus*; B.S., New York State College of Forestry, 1930

ARTHUR T. VIERTEL (1946-1975), *Associate Professor Emeritus*; B.S., New York State College of Forestry, 1942; Ph.D., 1954

WILLIAM L. WEBB (1937-1975), *Professor Emeritus*; *Dean Emeritus*; B.S., University of Minnesota, 1935; M.S., 1940; Ph.D., Syracuse University, 1950

FAY WELCH (1932-1967), *Lecturer Emeritus*; B.S., New York State College of Forestry, 1922

WALTER L. WELCH (1950-1965), *Associate Professor Emeritus*; A.B., Syracuse University, 1946

SIDNEY A. WHITT (1968-1976), *Professor Emeritus*; B.S., University of Alabama, 1933; M.S., Massachusetts Institute of Technology, 1937; D. Engr. Sc., New York University, 1962

HAROLD G. WILM (1953-1966), *Professor Emeritus*; *Associate Dean Emeritus*; B.S., Colorado College, 1929; M.F., Cornell University, 1930; Ph.D., 1932

LOUIS E. WISE (1919-1932), *Professor Emeritus*; B.A., Columbia University, 1907; Ph.D., 1911

Index

Academic Life 23
Academic Requirements 37
Activities, Extracurricular 41
Adirondack Ecological Center 13, 18
Administration, College 179
Admission
—Undergraduate 24
—Graduate 27
—School of Forest Technology 105
Advisement, Academic 37
Assistantships, Graduate 36
Athletics 42
Attendance, Class 37
Biology, Chemistry and Ecology, School of 47
Biology, Environmental and Forest 47, 52
Board of Trustees
—ESF 178
—SUNY 175
Calendar, Academic 3
Campuses, Regional System of 15, 17-18
Career Services 43
—School of Forest Technology 108
Chemical Ecology 66
Chemistry 60
—Biochemistry and Natural Products
—Option 61
—Environmental Chemistry Option 62
—Natural and Synthetic Polymer
—Option 63
Clubs and Organizations 41
College Proficiency Examinations 26
Commencement
—Fees 30
—Honors 39
Computer Center 17
Continuing Education 9
Cooperative Research Unit, U.S. Forest Service 12
Cornell University 121
Counseling
—Academic and Personal 43
—Career 43
—Health 45
—Religious 44
—Veterans 44
Course Offerings
—ESF 123
—Forest Technology 162
Cranberry Lake Campus 50, 51
Credit Hour Load 37
Correspondence .... Inside Front Cover
Degree Requirements
—Undergraduate 38
—Graduate 39
Ecology 52, 56
Economics, Forestry 96
Educational Communications Unit 16
Educational Opportunity Program 26
—EOP Grants 33
Ellis International Laboratory 18
Empire State Paper Research Institute . 11, 15
Employment 35
Engineering
—Forest Engineering 68
—Paper Science and Engineering 73
—Wood Products Engineering 76
Entomology 51, 56
Environmental
—and Forest Biology 47, 54
—and Resource Engineering,
—School of 67
—Assessment 87
—Biology Summer Program 50, 51
—Education/Communications 86
—Land Use Planning 87
—Physiology 57
—Science, Graduate Program in 83
Exchange Programs 55, 120
Expenses 28
—School of Forest Technology 106
Experiment Station 18
Extracurricular Activities 41
Faculty, College 180
Faculty Emeritus 193
Failures and Incompletes 38
Fees
—Application 28
—Advanced Payment 28
—Commencement 30
—Refunds 31
—Student Activity 29
Fellowships 35
Field Forestry Summer Program 50
Financial Assistance 32
Fish and Wildlife Biology 51, 57
Food Service 41
Forest
—Biology 47, 54

—Engineering 68
—Influences........................100
—Management 90, 95
—Pathology and Mycology 51, 58
—Technology, School of 103
Forestry
—Economics 96
—International 101
—School of 89, 93
—Urban 101
Genetic Field Station 18
Grades/Grade Point Average 37
Grant Programs 33,35
Graduation Requirements
—Undergraduate 38
—Graduate 39
Health and Medical Services 45
—Health Examination Board 27
Heiberg Memorial Forest 17
History and Traditions, College 5
Honor List, College 38
Housing and Board 40
—Cost of 30
Huntington Wildlife Forest 18
Instruction
—Continuing Education 9
—Graduate 8
—Professional 8
—Technical 8
Insurance, Health and Accident 45
Interdepartmental Areas of Study 66, 83
International Forestry Concentration 101
International Students
—Undergraduate 26
—Graduate 28
—Tuition Waivers 33
Landscape Architecture, School of 109
Land Use Planning
—Environmental 87
—Forest 96
Library 16
—Film Library 13
Loans 36
Management
—Forest 90, 95
—Policy and Resource 93
—Recreation 95
Medical Services 45
Newcomb Campus 13, 15, 18
Pack Demonstration Forest 18
Paper Science and Engineering 73
Pathology, Forest 51, 58
Pest Management 52
Physiology, Environmental.............57
Placement 43, 108
Plant Science 51, 58
Policy and Administration 95
Polymer Center, SUNY 12, 15
Probation 38
Professional Staff....................180
Public Service 13
Quantitative Methods 96
Recreation Management 95
Refunds 31
Regents Programs 33
Research 10
Resource Management and
Policy 93
Scholarships and Grants 33, 35
Silvics 52, 99
Silviculture 99
Silviculture and Forest
Influences, Department of 97
Social Security Benefits 34
Soil
—Ecology 59
—Science 100
State University of New York 175
Student Life 40
Summer Field Programs 50, 52
—Cost of 30
Syracuse Campus, ESF 15
Syracuse Metropolitan Area 21
Syracuse University
—Counseling 43
—Health and Medical Facilities 45
—Housing and Board 30, 40
—Student Organizations 42
Transfer Students
—Admissions 25
—Credit 25
Tree Improvement 100
Tuition and Fees 28
—Refunds 31
—School of Forest Technology 106
Tuition Assistance Program 34
Tully Campus 17
Ultrastructure Studies Lab,
N.C. Brown 12, 15
Urban Forestry Concentration 101
Veterans' Benefits 34
Vocational Rehabilitation Grants 34
Wanakena Campus 103
Warrensburg Campus 18
—Summer Session 50
Water Resources 86
Wildlife Biology 51, 57
Wood Products Engineering 76
—Forest Products Option 79
Work-Study Program 35
Zoology 51, 59

Campus Locator

Admissions	110 Bray
Affirmative Action	218 Bray
Alumni	121 Bray
Analytical and Technical Services	139 Baker
Assistant Vice President for Academic Programs	227 Bray
Assistant Vice President for Research	200 Bray
Audio-tutorial Center	16 Moon
Business and Fiscal Affairs	102 Bray
Career Services	115 Bray
Cellulose Research Institute	314 Baker
Community Relations	123 Bray
Computer Services	320 Baker
Counseling Services	107 Bray
Educational Communications	302 Illick
Empire State Paper Research Institute	317 Walters
Facilities	Maintenance Building
Film Library	9 Moon
Financial Aid	111 Bray
International Forestry	320 Bray
Institute of Environmental Program Affairs	200 Bray
Institutional Research	206 Bray
Library	101 Moon
Maintenance and Operations	Maintenance Building
Personnel	224 Bray
Polymer Research Institute	215 Baker
President	204 Bray
Publications	100 Bray
Registrar	113 Bray
School of Biology, Chemistry and Ecology	311 Baker
School of Continuing Education	231 Baker
School of Environmental and Resource Engineering	208 Walters
School of Forestry	106 Marshall
School of Landscape Architecture	331 Marshall
Security and Safety	8 Bray
Student Council	19 Marshall
Ultrastructure Studies Center	417 Baker
U.S. Forest Service Cooperative Research Unit	5 Moon
Veterans' Affairs	107 Bray
Vice President for Administration and Services	208 Bray
Vice President for Program Affairs	227 Bray
Vice President for Student Affairs	107 Bray

Coordinator for 503-504 Programs at the State University of New York College of Environmental Science and Forestry is David G. Anderson, Vice President for Administration and Services.

COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY
SYRACUSE NEW YORK 13210

U.S. POSTAGE
PAID
SYRACUSE N Y
PERMIT NO. 248

Roberta Jones
Assistant Registrar
113 Bray Hall

1980 - 81

General Catalog

SUNY COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY

CORRESPONDENCE DIRECTORY

Detailed information about the College may be obtained by addressing inquiries to:

The State University of New York
College of Environmental Science and Forestry
Syracuse, New York 13210
(315) 470-6500

Admission (Undergraduates)
Director of Admissions
110 Bray Hall
470-6600

Graduate Studies
Office of Academic Programs
219 Bray Hall
470-6599

Financial Assistance
Coordinator of Financial Aid
109 Bray Hall
470-6670

Transcripts and Academic Records
Registrar
111 Bray Hall
470-6655

Housing
Coordinator of Undergraduate Housing
Office of Residential Life
Steele Hall
Syracuse University
Syracuse, New York 13210
423-2720

Additional information is available upon request from any of the above addresses. This undergraduate/graduate catalog was published by the College of Environmental Science and Forestry, August 1980.

The calendar, courses, tuition, and fees described in this catalog are subject to change at any time by official action either of the State University of New York Board of Trustees or of the College of Environmental Science and Forestry.

State University of New York

COLLEGE OF

ENVIRONMENTAL SCIENCE AND FORESTRY

1980-81
General Catalog

TABLE OF CONTENTS

ACADEMIC CALENDAR 3

ESF: WHAT'S IN A NAME? 5

THE MISSION: INSTRUCTION, RESEARCH, AND PUBLIC SERVICE .. 8

THE CAMPUSES 15

THE SYRACUSE METROPOLITAN AREA 21

ACADEMIC LIFE 23

Undergraduate Admission 24

Admission Procedures 24

Graduate Admission 27

Expenses 28

Financial Assistance 32

Academic Policies 37

Student Life 46

Degree Programs and Areas of Study 50

GRADUATE EXCHANGE PROGRAMS 125

COURSE OFFERINGS 127

STATE UNIVERSITY OF NEW YORK 182

COLLEGE TRUSTEES AND ADMINISTRATION 184

COLLEGE FACULTY AND PROFESSIONAL STAFF 186

INDEX 202

CAMPUS LOCATOR .... Inside Back Cover

Academic Calendar

SYRACUSE CAMPUS

FALL 1980

Registration	September 3, 4	Wednesday, Thursday
First Day of Classes	September 5	Friday
Yom Kippur (no classes)	September 20	Saturday
Thanksgiving Vacation	November 26-30	Wednesday-Sunday
Last Day of Classes	December 12	Friday
Exam Period	December 15-19	Monday-Friday

SPRING 1981

Registration	January 13, 14	Tuesday, Wednesday
First Day of Classes	January 15	Thursday
Spring Recess	March 7-15	Saturday-Sunday
Last Day of Classes	April 29	Wednesday
Reading Day	April 30	Thursday
Exam Period	May 1-7	Friday-Thursday
Commencement	May 9	Saturday


STATE
OF NEW
COLLEGE OF
ENVIRONMENTAL
SCIENCE AND

ESF: What's In A Name?

1911. Governor John A. Dix signed a bill establishing the New York State College of Forestry at Syracuse University.

1948. Legislative action incorporated into State University of New York all state-supported higher education. Thus, the State University College of Forestry at Syracuse University.

1972. By special legislative act, the College was renamed the State University of New York College of Environmental Science and Forestry.

Why, in the first place, all the name changes? And, secondly, what difference do they make? What, really, is in our name?

ESTABLISHING A TRADITION

While a professional forestry education in this country is almost entirely a development of the twentieth century, its primary roots can be traced back as early as 1862 when Congress passed the Morrill Act establishing a system of land-grant colleges.

The growing importance of forests in America's economy was reflected in the 1870 census, when, for the first time, information on forest resources was included. Several attempts to establish a national school of forestry were made; while none was approved, the movement shows that there was considerable demand for professionally trained foresters.

By 1900 there was a spirit of reform in the country—the same spirit that produced the early muckrakers also produced a generation interested in the conservation, preservation and careful management of precious natural resources. Between 1903 and 1914, 21 schools of forestry were established.

The first college of forestry in this country to offer a full, four-year undergraduate program was established in 1898 at Cornell University. Under the leadership of Bernard E. Fernow, students were introduced to critical field experience in their junior and senior years at the college's 30,000-acre forest in the Adirondack Mountains. There, Fernow taught many experimental management practices, including clear-cutting and surface-burning. These techniques have always been controversial, and they aroused criticism by the wealthy summer residents in adjacent areas of the Adirondacks. After only five years of operation, the Cornell College of Forestry was closed in 1903 when the state Legislature, yielding to the influential property owners, ended fiscal support.

The beginnings and early development of the New York State College of Forestry were largely due to James R. Day, chancellor of Syracuse University, and community leaders who were attuned to the growing national

sentiment favoring forest conservation and who sensed the need for a professional school of forestry. The legislative act which created the College instructed that the institution "conduct such special research in statewide investigations in forestry as will throw light upon and help in the solution of forestry problems. . ." and that it be "the institution for educational work in forestry in the State."

From the very first years of its existence under the first dean, Hugh P. Baker, the College responded to the broad needs of environmental professionalism. While other schools and colleges of forestry became more specialized, the College at Syracuse broadened to include the essentials of environmental science: design, engineering, and the life sciences, as well as resource management.

BROADENING THE BASE

With the formation of the State University of New York in 1948, coordination and systematization came to higher education in the state. The University, according to its charter, was to "supplement, not supplant, the great network of private colleges and universities." The College of Forestry, which from its beginning had been state-supported and governed by a Board of Trustees currently made up of nine members appointed by the Governor and six *ex officio* members, was recognized as a specialized college within the State University system.

Stemming from Chancellor Day's early sponsorship of the College, Syracuse University and ESF have long been engaged in numerous fruitful devices of institutional cooperation. This relationship is probably the most outstanding example in this country of collaboration between public and private institutions of higher education. Even as a part of State University, the College maintains this unique position. The major character of the relationship stems from the fact that since its beginning, the College purchased from Syracuse University the major portion of its supportive and enrichment instruction, thus allowing the College to more fully develop its professional upper division and graduate level instruction.

Other cooperative areas are living centers and dining facilities, athletic programs, the use of the University's infirmary and health counseling services, the bookstore facilities, the University library system, and participation in numerous social activities including the elaborate religious, dramatic, and cultural benefits of a large university.

ESF TODAY

The third phase in the evolvement of the College's name came in 1972 when it was rechartered as the State University of New York College of Environmental Science and Forestry. Thus, the name reflects more deeply the traditional grounding and concern of forestry in the environment; it illuminates more clearly the capabilities of its program.

The College of Environmental Science and Forestry has completed a plan, conceived more than 10 years ago, to achieve complete upper division/graduate status. Undergraduate students wishing to embark upon a career in the environmental sciences and forestry will enroll for two years at a junior college or four-year institution, studying an ESF prescribed program and transfer to this college as juniors. The move to upper division/graduate college status marks another step in the College's long-standing commitment to educate professionals capable of facing the complex environmental problems of today and of the future.

For nearly 70 years, the full thrust of the State University of New York College of Environmental Science and Forestry has been focused on the environment on all of its six campuses and in each of its three mission areas—instruction, research, and public service. The College has been, and continues to be, devoted to the advancement of environmental science and forestry.

The Mission: Instruction, Research, and Public Service

INSTRUCTION

In the fall of 1979, student enrollment reached 1,864. Of this number, 1,422 were undergraduates and 442 were graduate students. In addition, there were 25 students engaged in postdoctoral work.

Undergraduate Education

At the baccalaureate level, the College offers professional study in eight areas: chemistry; environmental and forest biology; environmental studies; *forest engineering; paper science and engineering; wood products engineering; resource management;* and *landscape architecture*. These programs are registered with the New York State Education Department.

Each of these curricula leads to the bachelor of science degree. In the case of landscape architecture, an additional year of study results in a bachelor of landscape architecture degree, and in the forest engineering program, a fifth year leading to a bachelor's degree in civil engineering can be taken at Syracuse University or State University at Buffalo.

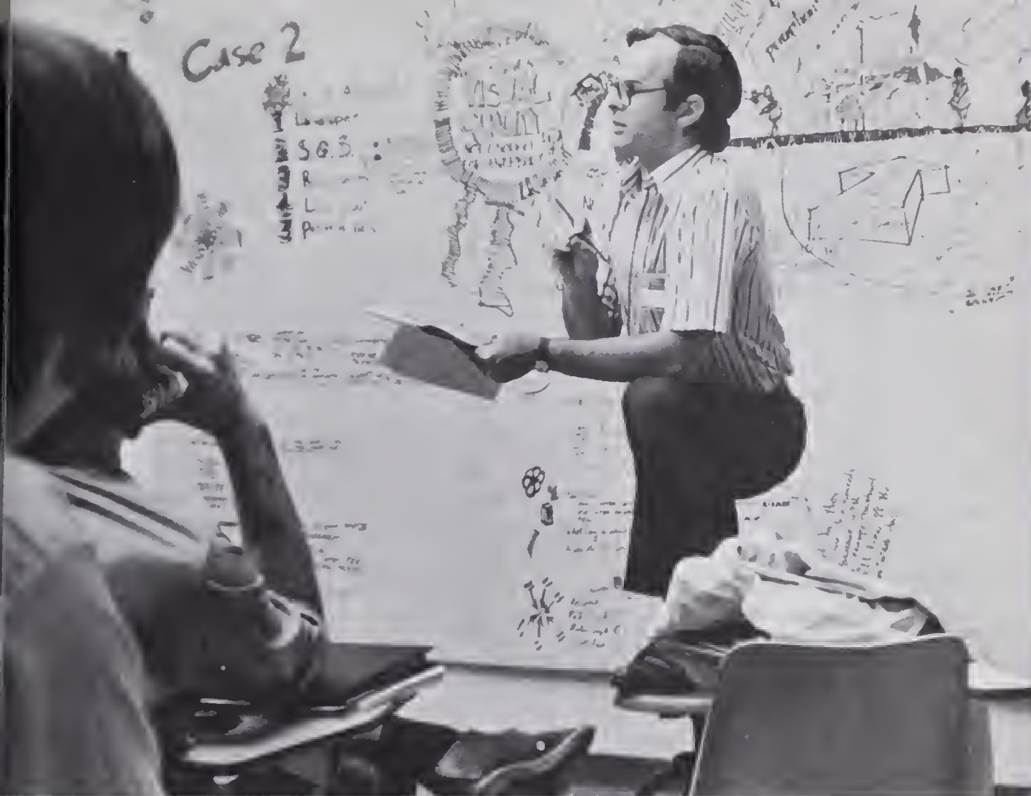
Graduate Education

The College awarded its first graduate degree in 1913. Today the College offers advanced degrees in seven major program areas: *environmental and forest biology, chemistry, resource management and policy, silviculture and forest influences, environmental and resource engineering, landscape architecture, and environmental* science. These programs are registered with the New York State Education Department.

Graduate study leads to the master of science degree, the master of landscape architecture degree, and the doctor of philosophy degree. A postdoctoral study program, closely related to the College's research effort, is also available.

Technical Education

At the paraprofessional level, the College has been training forest technicians since 1912 at its Wanakena Campus in the Adirondack



Mountains. It is the oldest Ranger School in the United States and offers a two-year *forest technology* curriculum. Graduates are awarded an associate in applied science degree. In this curriculum, students take their first year of general education at a two- or four-year college. The second year, with its emphasis on practical field training in the relationships between forest technology and managerial needs, is taken at Wanakena with its 2,800 acres of forested land. Graduates of this degree program in practical forestry are prepared for positions as forest rangers; federal, state, and private industry forest technicians and forestry aides; district forest supervisors; timber inventory specialists; timber sales supervisors; forest surveyors and engineering aides; and forest protection technicians.

Continuing Education

The philosophy that education is a lifelong pursuit is an ancient one and was written into the law creating the College. This concept is doubly important to the sciences and professions in this technological age when, with knowledge expanding in all directions, major environmental problems still remain to be resolved. The informational needs of New York's citizens also are undergoing change. The increasing urban character of our population; the changing pattern of agricultural and forest land ownership and use; the rise in level of education and sophistication in a more efficient society; and the increase in leisure time, travel mobility and need for recreational facilities and pursuits all contribute to a growing need for educational opportunities in environmental science and forestry for adult audiences.

The College has, over the years, succeeded in communicating knowledge on forest resources management, utilization, and conservation to a variety of off-campus publics. The entire College faculty has contributed to these programs. To reinforce this commitment, the College established a School of Continuing Education upon which to base expanded educational opportunities at both the undergraduate and graduate course levels.

Conferences, symposia, seminars, and shortcourses on various aspects of forestry and the related sciences are conducted at both the basic and applied levels. Audiences include forest owners, managers, and operators; wood engineers and forest industries personnel; academic and scientific groups; conservation and recreation personnel from local and other public and private planning groups; and citizen-action committees. Upon request, continuing education programs can be designed to meet specific needs of professional organizations, agencies, and industry. Credit or noncredit courses, at campus or off-campus sites, can be arranged.

Expansion of "in-service" training courses, establishment of "environmental learning centers" on College forest properties, and production of media materials for public information and education are examples of activities directed toward updating and upgrading professional clients and broadening the public's awareness and appreciation of New York's forestlands and other natural resources.

For information on specific continuing education projects, inquiries should be sent to Dean, School of Continuing Education.

RESEARCH

The College's commitment to scientific inquiry stretches far back to its second year of existence. In 1912, Dean Hugh P. Baker initiated the first research project of the College by joining forces with the U.S. Forest Service in an industry study designed to show what kinds of firms were using wood in New York State and the species and quantities of lumber they used.

In the 1980's, the College's research program has attracted a worldwide clientele of industrial, governmental, professional and scientific groups, and through liaison with them, the program maintains its vigor and relevancy to the important environmental issues of the decade. Support from this clientele amounts to about $4.5 million a year, a four-fold increase in the last decade.

Students and faculty from across the College contribute to the depth and diversity of the research program. Findings from these studies are applied to a host of issues and problems through various demonstrations and information devices. Recent examples include studies of limestone quarry reclamation; the development of polymeric materials for artificial human organs; nonchemical control measures for insect pests, e.g., the gypsy moth; studies of the ecology of Antarctic birds; new wood pulping processes leading to pollution-free water and air effluents; and the ecological effects of winter navigation in the Great Lakes and the St. Lawrence River.

The Institute of Environmental Program Affairs

The Institute of Environmental Program Affairs (IEPA), created at the College in 1972, is an umbrella-like structure that coordinates the overall research effort of the College with the efforts of other academic institutions, public agencies and private industries for a concerted attack on compelling and complex environmental problems. IEPA expands the College's ongoing examination of its appropriate role as a leader in environmental education for the 1980's and beyond in face of urgent appeals for multidisciplinary approaches, for problem-oriented task forces by both faculty and students, and for the greater application of higher education to society's needs. Because it is a process, the Institute preserves the identity of each collaborator: institutions, faculty members and students come together for just as long as necessary to solve a problem, then return to other ongoing areas of interest. Important projects have included: resource and environmental studies for the St. Lawrence Eastern Ontario Commission, and the Tug Hill and Catskill study commissions; a study of wetlands evaluation systems for the Adirondack Park Agency; development of environmental impact assessment guidelines for the New York State Department of Environmental Conservation; a study of selected environmental impacts of possible nuclear power developments in New York State for the Argonne National Laboratory; and studies of the St. Lawrence River ecosystems and impacts of oil spills and extension of the shipping season for the U.S. Environmental Protection Agency and the U.S. Fish and Wildlife Service, respectively.

Additional projects include an analysis of the effects of acid precipitation on terrestrial ecosystems, reclamation studies of mines and quarried lands, and biomass potentials for energy production. Work is also anticipated in the areas of stream channel response to land use changes and social and political factors affecting disposal of sewage on land areas.

Empire State Paper Research Institute

The Empire State Paper Research Institute (ESPRI), located on the main campus, is the only worldwide basic research organization in the pulp and paper field. It performs investigations in cooperation with the Empire State Paper Research Association (ESPRA), which is comprised of 75 pulp and paper companies in 12 countries. The Institute was established in 1945 when the members of ESPRA recognized the need for new scientific and technical knowledge and methods, and since then ESPRI has been able to maintain an efficient balance between the practical and theoretical bases of the pulp and paper industry.

Housed in the modern J. Henry Walters Hall with its own pilot paper mill, and staffed by scientists who are internationally recognized for their accomplishments, ESPRI provides a research base for long-range industry development. Its program has widened in scope to cover almost all aspects of pulping and papermaking, including additive retention, oxygen pulping and bleaching, effluent control, sheet drying, printability, and energy efficiencies.

Polymer Research Institute

Scientists at the College have made many original contributions to the field of pure and applied polymer chemistry, including the development of living polymers, the study of anionic polymerization and electron-transfer initiation, and work on the permeation of gases and films through polymeric films.

College faculty members specializing in polymer chemistry have trained several hundred graduates and postdoctoral researchers, many of whom now hold leading positions in universities and industrial and governmental laboratories.

U.S. Department of Agriculture—Forest Service Cooperative Research Unit

The Northeast Forest Experiment Station of the U.S. Department of Agriculture-Forest Service maintains a research center at the College. Until 1977, this unit pursued studies of forest-centered recreation with the aim of developing improved methods for integrating recreation and other uses of forests.

Beginning in 1978, the Cooperative Research Unit was re-oriented to research on urban environmental forestry problems. This provides increased opportunities for faculty and students to collaborate with Forest Service scientists in studies of a variety of urban and environmental problems.

Nelson Courtlandt Brown Laboratory for Ultrastructure Studies

This Center, located in Baker Laboratory, is a teaching, research, and service facility of the College. It is equipped to handle virtually every type of modern microscopy. This includes light, scanning electron, and transmission electron microscopy. Among the major items of equipment are: two RCA EMU-3 transmission electron microscopes; an RCA EMU-4, an ETEC Autoscan scanning electron microscope, energy dispersive X-ray analyzer, several types of light microscopes, high vacuum evaporators, microtomes and ultramicrotomes. The laboratory resources include specimen preparation rooms, several photographic darkrooms, three electron microscope laboratories and other supporting facilities.

The primary service of the Center is teaching; course offerings include photomicrography, scanning electron microscopy, and interpretation of cellular ultrastructure. Research is a second major activity since support is provided for students, faculty, and research staff who have projects involving structural studies. Public service is extended to local high school groups, medical facilities, other regional colleges and universities, and industry.

Adirondack Ecological Center

The Adirondack Ecological Center (AEC) is located on the College's Newcomb Campus in the center of the Adirondack Mountains. Staffed by resident scientists, technicians, and support staff, the AEC conducts studies of the Adirondack region year-round. Research includes studies of managed and unmanaged forest lands, wildlife populations and habitats, terrestrial and aquatic ecology, and wilderness management. Work is carried on in close collaboration with the New York State Department of Environmental Conservation, the U.S. Fish and Wildlife Service, the U.S. Department of Agriculture, and forest industries.

The vigorous research program of the Center provides excellent opportunities for collaboration by Syracuse-based faculty and students. Several graduate students are regularly in residence at Newcomb pursuing their thesis research.

Renewable Materials Institute

The Renewable Materials Institute (RMI) has as its principal goal research on wood and other renewable materials such as agricultural waste products, which would include straw, rice hulls, and bagasse. To meet its mission, research on the characterization of the material itself is primary. Closely related with it is the determination of physical properties which control the behavior of the material during utilization as well as in use in consumer products. In exploring renewable materials, strong emphasis is placed on energy considerations. This can be in terms of energy savings during production or economies of energy because of the use of the end product in housing or in some other application. Also included are related studies in the combustion of wood, the efficiency of heating with wood and the emissions resulting from wood combustion.

The principal facilities for the materials characterization are found in the Center for Ultrastructure Studies and include the transmission electron microscopes, a scanning electron microscope with EDXA and rapid particle analysis. All of the facilities of the Department of Wood Products Engineering are also available, including a sawmill, veneer and plywood manufacturing facility, dry kilns, wood machining equipment, and timber testing laboratory. The facilities of other research institutes and Departments in the College are also available for special projects.

Tropical Timber Information Center

The Tropical Timber Information Center (TTIC) provides identifications of wood samples and information about tropcial woods for both general characteristics and technical properties. These services are oriented toward importers and users of tropical woods. The Center began operation in 1975 as part of the Department of Wood Products Engineering and is one of only two such sources of information in the western hemisphere. The Center also carries out special studies under contract for production of data that is not available in the literature. The technical base for operation of the Center is a large, worldwide collection of authenticated wood samples and an extensive collection of reference materials in Moon Library and the Department of Wood Products Engineering. Both of these resources have been built up over the past 60 years by close cooperation with institutions throughout the world. Activity of the Center is primarily oriented toward requests for services from importers and users of tropical woods and to the expansion of the reference collections of wood and library materials.

Cellulose Research Institute

Research at the Cellulose Research Institute is at present centered on the fine structure of native cellulose and its transformations into other commercially important forms of cellulose. For example, the structural differences between native and regenerated celluloses have been determined, for the first time, through x-ray crystallographic studies. The same techniques are now being used to study the structural aspects of cellulose mercerization, an important commercial process in cellulose chemistry. Other, recent research has been concerned with the organization, chemical composition, and function of the vascular cambium in trees, the ultimate source of all wood and bark produced in nature.

PUBLIC SERVICE

The College, throughout its 69-year history, has continued to respond to its specific legislative mission prescribing major responsibilities in the area of public service. Public education and information, technical advice and guidance to cooperating local, state, and federal agencies and organizations, and technical assistance to the forest and wood-using industries constitute the principal formal public service activities. The Institute of Environmental Program Affairs (described in the Research section) coordinates the College's public service activities on the professional level.

While the list of public service contributions is lengthy, a few examples include: the College's Film Library; the Tree Pest and Disease Service, which provides technical advice to private citizens and to governmental agencies; and the participation of ESF faculty members in Central New York's Poison Control Center. Altogether, the public service programs of the College reach approximately one million New York State residents each year.

The Campuses

The College operates a multiple campus system with regional campuses and field stations located at Syracuse, Tully, Wanakena, Warrensburg, Cranberry Lake, Newcomb, and Clayton. This system is composed of about one million square feet of facilities in 179 buildings and 25,000 acres of land. Collectively, they represent the largest fully-utilized campus in the world.

THE SYRACUSE CAMPUS

The main campus is in Syracuse and lies on 12 acres adjacent to Syracuse University in an area that traditionally has been known as "The Hill." Located here are the Schools of Biology, Chemistry, and Ecology; Environmental and Resource Engineering; Forestry; Landscape Architecture; and Continuing Education. In addition, the main campus houses the Institute of Environmental Program Affairs, the Empire State Paper Research Institute, the State University Polymer Research Center, a cooperative research unit of the U.S. Forest Service, and an ultrastructure center.

These program units are housed in five major academic buildings (Baker Laboratory and Walters, Bray, Marshall and Illick Halls). The administrative headquarters of the College is located in Bray Hall. The main campus also embraces Moon Memorial Library, the Maintenance Building and several other small service and storage facilities.

Specialized facilities at the Syracuse campus include electron microscopes, plant growth chambers, air-conditioned greenhouses, an animal environmental simulating chamber, a bio-acoustical laboratory, a 1,000-curie cobalt-60 radiation source, radioisotope laboratory, computer center, and specialized instrumentation including nuclear magnetic resonance spectrometer, electron spin resonance spectrometer, mass spectrometer, ultracentrifuge, and X-ray and infrared spectrophotometer. Photogrammatic and geodetic facilities of the forest engineering department include one of the most extensive arrays of equipment in the United States, with a Nistri TA-3 stereocomparator, Mann comparator, computerized Nistri photocartograph, and nine other varieties of plotters. The paper science and engineering laboratory has a semicommercial paper mill with accessory equipment. The wood products engineering department has a complete strength-of-materials laboratory as well as a pilot scale plywood laboratory and a machining laboratory. The greenhouses and forest insectary are used to produce plant and insect material for classroom and laboratory. Extensive collections are available for study, including wood samples from all over the world, botanical materials, insects, birds, mammals, and fishes.

The **F. Franklin Moon Library** contains more than 71,000 cataloged items. Over 800 journals and corresponding indices are currently received. The collections constitute an information center for forestry and environmental science programs in ecology, botany and pathology, biochemistry, chemical ecology, forest chemistry, polymer chemistry, economics, entomology, environmental studies, industrial pollution abatement, landscape architecture, environmental design, management, paper science and engineering, photogrammetry, silviculture, soil science, water resources, world forestry, wildlife biology, wood products engineering, and zoology. These are supplemented by large collections in the environmental resource field. Additional strength is found in the comprehensiveness of abstract and indexing services relevant to the College's programs. The library also offers a broad choice of general interest reading material.

The collections of Syracuse University libraries and State University Upstate Medical Center are within walking distance. They may be used by all members of the College of Environmental Science and Forestry. Arrangements often can be made to use industrial libraries in the Syracuse area. Other collections are accessible through the Inter-library loan privilege.

The library building, opened in 1968, can accommodate 132,000 volumes and can seat 575 persons. The main reading areas are in the center of the upper level surrounding open stacks. The library contains a current periodicals room, bibliographic center, individual study carrels, and library staff offices. The archives, special collections, conference rooms, autotutorial center, and informal study rooms are located on the lower level.

The autotutorial center provides facilities for study with nonbook materials. Slides and cassettes prepared as integral units of particular courses are held on reserve for use in the center. Materials are available for review on weekends, evenings and times when other facilities are closed.

Leisure reading material, distributed throughout the total collection, represents the Robin Hood and Raymond F. Crossman collections, which contain books on national and world social problems, humanities, education, and popular books concerned with the environment. The archives consist of historical items relevant to the College and forestry developments in New York State. The special collections room contains rare and valuable books and folios.

Reference service, orientation, and bibliographic instruction (Library Research 300) are provided by the librarians. Study guides, user aids, and other such publications are prepared and distributed by the librarians as needed.

The **Educational Communications** unit directly supports the program areas of the College through development and application of media materials and methods for the classroom, for the presentation of research findings, and for public service endeavors. These include television programming, slide/tape and motion picture production and photographic services. Other services to the College community include engineering, audio-visual equipment distribution, and maintenance and support functions. The Educational Communications staff also participates directly and actively in instructional programs in environmental communication at both the undergraduate and graduate levels, as well as through the School of Continuing Education.

The College **Computer Center** provides computational service via terminals connected to the Syracuse University academic computer facilities. Two computer systems are accessible—an IBM-370 model 155 used for batch processing and APL, and a large Digital Equipment Corporation DEC-KL10 used primarily for time-sharing applications. Computer usage can be classified into academic and administrative categories with the academic use amounting to 80 percent of the total College load. The major academic use is in the graduate programs where students investigate problems in areas such as hydrology, transportation networks, forest and tree growth studies, genetics, disease and insect behavior and controls, land use, production and processing techniques, polymer and cellulose chemistry, cellular ultrastructure, photogrammetry and remote sensing, landscape architecture, and other related and supporting fields.

THE TULLY CAMPUS

Located about 25 miles south of Syracuse is the Tully Campus which is composed of the Heiberg Memorial Forest and the Genetic Field Station.

Heiberg Memorial Forest is located on the northern escarpment of the Allegheny Plateau. It includes 3,800 acres of diverse terrain and forest growth. The Forest is utilized both as an extensive outdoor teaching laboratory and as a site for intensive research. The Forest Ecosystem Lab, which is a highly instrumented outdoor teaching laboratory; a large complex of all-weather classrooms; many experimental plantings, some from known seed sources from throughout the world; a commercial-scale maple syrup operation; and an experimental deer research area are among the developments on this forest. Each fall the Heiberg Memorial Forest is the site of an intensive program for environmental and resource management students in a total ecosystem approach to forest community management instruction.

The **Genetic Field Station** is located adjacent to the Village of Tully. It is in a particularly fertile area and is devoted to relatively short-term outplantings of plant materials developed in the various genetics research projects of the College.

THE WANAKENA CAMPUS

The Wanakena Campus is located on the Oswegatchie River, 65 miles northeast of Watertown and 35 miles west of Tupper Lake. This campus, with its large instructional and demonstration forest, supports the College's **School of Forest Technology**, the oldest forest technician school in the country. It is on this campus that forest technicians are trained in an associate degree program.

THE WARRENSBURG CAMPUS

The Warrensburg Campus is located in the southeastern Adirondack region and encompasses the Charles Lathrop Pack Demonstration Forest, an area of roughly 2,500 acres of heavily forested land noted for its white pine. The Forest has been under intensive management since 1927 for the combined purpose of instruction, research, and demonstration in forestry and allied fields.

Each year this campus hosts the Summer Session in Field Forestry, a five-week course devoted to introductory instruction in field forestry principles and techniques. The course is required of all entering students in Environmental and Resource Management and is open to election by students in Environmental and Forest Biology. Formal offerings in Continuing Education and various meetings and conferences are also held here for practicing professionals and organizations directly associated with forestry and allied environmental fields.

THE CRANBERRY LAKE CAMPUS

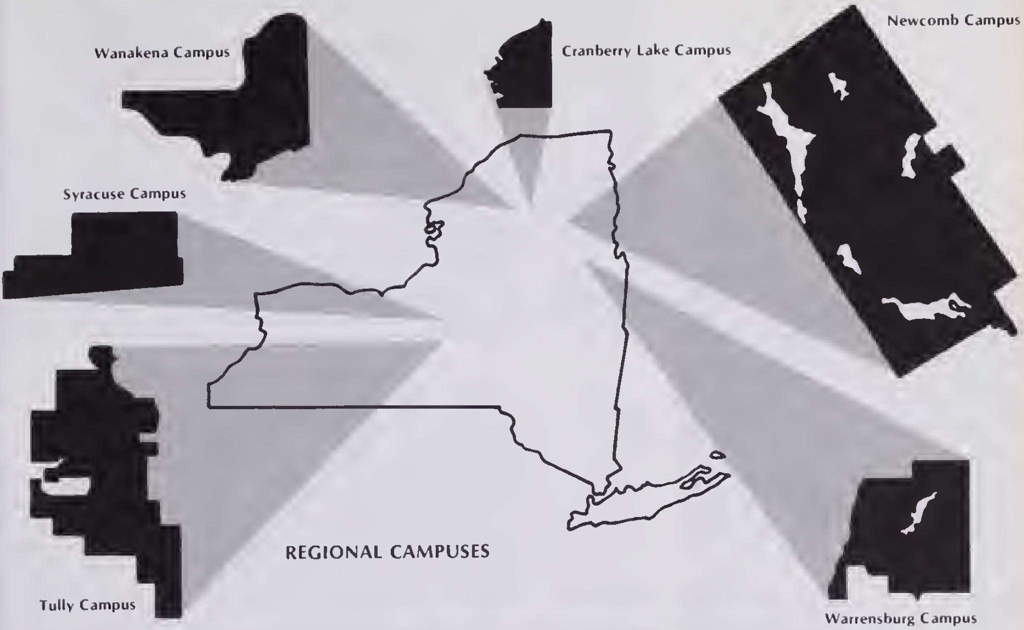
The Cranberry Lake Campus, accessible only by boat, is the site of the College's biological station, where, every year, a cooperative program in environmental biology is sponsored jointly by the College and other institutions of higher education. Bounded by 150,000 acres of forest preserve, by Cranberry Lake, and by isolated forest bogs and beaver meadows, the extensive facilities are intensely utilized in a comprehensive curriculum of upper-level and graduate courses.

THE NEWCOMB CAMPUS

Located in the central Adirondack Mountains, Newcomb is the largest of the regional campuses and home to the **Adirondack Ecological Center** where extensive studies of animal biology and ecology are carried out. Located there also is **The Archer and Anna Huntington Wildlife Forest**.

THE FIELD STATIONS

In addition to its regional campus system, the College operates several field stations which directly support the programs of the institution. The 44-acre **Forest Experiment Station**, located only a few minutes drive from the main campus, is used to support main campus academic programs. Located at the Station are a large arboretum, tree nursery, and experimental greenhouse facility. Adjacent to the Tully Campus is the College's **Genetic Field Station**. With its irrigation system and layout of level blocks, it is an



excellent facility for developing hybrids, for grafting experiments, and for research in heritability. A magnificent island, the **Ellis International Laboratory**, is situated in the heart of the Thousand Islands—St. Lawrence River area off the village of Clayton. Accessible only by boat, this laboratory is an unusually appropriate site for the College-wide, cooperative and international environmental monitoring and research activities. The College's most recent acquisition is a facility on **Wellesley Island** where a former U.S. Coast Guard Station is being converted to a field station to augment the work at Ellis Laboratory.


Larry's
PIZZA
SANDWICHES
TAKE OUT & DELIVERY
OUR SPECIALTY

The Syracuse Metropolitan Area

The College of Environmental Science and Forestry is located on one of several hills that overlook Syracuse, a growing metropolitan area of nearly 500,000. Known as the "Salt City" because of the great salt industry which was centered here for more than seventy years, Syracuse is today a city of diversified industry and commerce. The area is a leader in the manufacture of china, quality shoes, air conditioning equipment, medical diagnostic equipment, drugs, automotive parts, and lighting equipment.

The City of Syracuse offers students many cultural, recreational and educational opportunities, including a symphony orchestra, several museums, live theater and historical points of interest.

Called the "Crossroads of New York State," Syracuse is one of the few cities in the nation situated at the crossing point of two major superhighways. It is located at the intersection of the 500-mile east-west New York State Thruway and the north-south Penn-Can Highway. Driving time from New York City, Philadelphia, Boston, Toronto and Montreal is about five hours; from Buffalo and Albany about three hours. The city is served also by a modern international airport and major bus and rail lines.

Academic Life

Society is increasingly in the hands of those who have broad foresight and a balance of judgment in applying scientific, sociological, and technical knowledge to guide human and environmental forces. Modern civilization—with its compelling demands from industry, government, and educational institutions—requires people who think objectively and constructively, and who act creatively and responsibly.

From its beginnings in 1911, the State University of New York College of Environmental Science and Forestry has served New York State and the nation in meeting the needs of its citizens in regard to the environment through education, research, and public service. The faculty and students of the institution are committed to the resolution of immediate environmental problems, the development of the knowledge necessary to predict occurrences in the future, and the presentation of public policy alternatives that will both protect the environment and accommodate the real needs of society.

At the undergraduate level, ESF offers curricula in the general areas of resource management, engineering, environmental design, and the physical and life sciences that prepare graduates to enter and contribute to the professional world or to continuing their education at the graduate level, at ESF or elsewhere.

Graduate years are a time of discovery and excitement, a time of answers and new insights, a time of personal productivity and contributions to scholarship. It is during graduate education that the student sharpens the ability to think critically and analytically, to plan research, to design experiments, to work effectively with the basic research tools as well as specialized equipment, and to undertake the discipline of purposeful study toward a specific goal.

The College currently supports significant graduate degree programs in six discipline areas and in its broad program in Environmental Science, which encourages multidisciplinary study. Both undergraduate and graduate programs of the College reflect the work of its faculty and their student colleagues, who, together, utilizing some of the most modern facilities and laboratories in the country, maintain a long-standing tradition of academic and professional excellence.

This catalog provides an introduction to the College and its programs of undergraduate and graduate study and research. It only begins to suggest the diversity and depth of the existing and potential programs that make environmental science the challenge of the 1980's and beyond.

UNDERGRADUATE ADMISSION

The College of Environmental Science and Forestry is an upper division/graduate center, enrolling at the undergraduate level transfer students who have completed at least two years of postsecondary coursework. Outstanding high school seniors can assure their acceptance by the College as junior transfers by applying to the Advanced Early Admission program.

Freshman and sophomore level courses may be taken at any two- or four-year college or university; all students considering transfer to ESF as juniors should follow the prescribed program appropriate to their intended major at the College. Each curriculum offered at the College of Environmental Science and Forestry and listed in this catalog defines the required lower division courses necessary for admission. These requirements are listed in the Areas of Study section of the catalog.

Students who are certain they intend to transfer to ESF may enroll in established pre-environmental science programs organized by the College in cooperation with a number of two- and four-year colleges in and out of New York State. Students who attend these colleges will find a smooth articulation has been established and upon successful completion of these prerequisites will generally gain admission to the college with full junior status. It is not required to specifically attend one of these colleges; a student may obtain the necessary lower division courses at almost any college or university in the country.

Application to ESF's associate degree program in Forest Technology at the Wanakena Campus must be made one year in advance. Therefore, high school students desiring to attend the Wanakena program in 1982 must apply this year. For further information on ESF's School of Forest Technology, see page 119, or contact the Office of Admissions.

ADMISSION PROCEDURES

ADVANCED EARLY ADMISSION PROGRAM

High school students who are strongly motivated toward attending ESF may apply to the College of Environmental Science and Forestry during their senior year under the *Advanced Early Admission Program*.

Those seniors whose academic background is successfully competitive will receive a letter of acceptance to the College for entrance two years later with full junior status, contingent upon successful completion of all prerequisite courses of the first two years of the curriculum to which they have been admitted. The prerequisite courses will be outlined and described in an enclosure with the acceptance letter.

This early acceptance will alleviate much of the anxiety about admissibility. High school seniors will know prior to graduation if they have been accepted to the College for entrance at the junior level. It affords those accepted students the opportunity to attend any college of their choice that offers the appropriate lower division courses. SUNY applications for the Advanced Early Admission Program may be obtained from a high school guidance office or from the Office of Admissions at ESF.

TRANSFER ADMISSIONS

For those students not accepted under the Advanced Early Admission Program, admission to the College of Environmental Science and Forestry is based on the student's previous college coursework, overall academic aptitude, and interest in the programs offered at this College. Consideration is given to both the quality and appropriateness of the student's prior academic experience. The minimum grade point average for acceptance is 2.0 (4.00 = A).

PRE-ESF COOPERATIVE TRANSFER PROGRAMS

The College, working in cooperation with other collegiate institutions, both in and out of New York State, has developed over 47 pre-environmental science and forestry programs. The development of these programs illustrates that high school students can look forward to a wide selection of colleges in which they can obtain all the necessary lower division courses to transfer to ESF as full juniors.

These colleges represent the total spectrum of higher education (private, public, 4-year, 2-year) and are located in New York, Connecticut, Massachusetts, New Jersey, Pennsylvania, and Rhode Island. Students who attend these colleges will find a smooth articulation has been established and once they transfer to ESF will share a common academic background with other transfer students.

Currently, the list of cooperating colleges includes: *New York State Colleges*: Adirondack Community College, Glens Falls; Broome Community College, Binghamton; Canisius College, Buffalo; Cayuga County Community College, Auburn; Columbia Green Community College, Hudson; Community College of Finger Lakes, Canandaigua; Corning Community College, Corning; Dutchess Community College, Poughkeepsie; Erie Community College, Buffalo; Genesee Community College, Batavia; Herkimer Community College, Herkimer; Hudson Valley Community College, Troy; Jamestown Community College, Jamestown; Jefferson Community College, Watertown; LeMoyne College, Syracuse; Mohawk Valley Community College, Utica; Monroe Community College, Rochester; Nassau Community College, Garden City; Niagara County Community College, Sanborn; North Country Community College, Saranac Lake; Onondaga Community College, Syracuse; Orange Community College, Middletown; Paul Smith's College, Paul Smiths; Rockland Community College, Suffern; Siena College, Loudonville; Suffolk County Community College, Selden; Sullivan County Community College, Loch Sheldrake; SUNY Canton Ag & Tech, Canton; SUNY Cobbleskill Ag & Tech, Cobleskill; SUNY Delhi Ag & Tech, Delhi; SUNY College at Geneseo, Geneseo; SUNY Morrisville Ag & Tech, Morrisville; SUNY New Paltz, New Paltz; SUNY College at Oswego, Oswego; Syracuse University, Syracuse; Tompkins Cortland Community College, Dryden; Ulster County Community College, Stone Ridge; Westchester Community College, Valhalla; *Out-of-State Colleges*: Berkshire Community College, Pittsfield, Mass.; Camden County College, Blackwood, N.J.; Housatonic Community College, Bridgeport, Conn.; Keystone Junior College, LaPlume, Pa.; Kirkwood Community College, Cedar Rapids, Iowa; Mercer County Community College, Trenton, N.J.; Middlesex Community College, Edison, N.J.; Ocean County College, Toms River, N.J.; Roger Williams College, Bristol, R.I.; Union College, Cranford, N.J.

TRANSFER CREDIT

Courses transferred for credit must be appropriate to the student's curriculum choice. Credit will be awarded for all such courses completed with a passing grade of "D" or better.

Furthermore, courses to be transferred as required courses in a curriculum must be acceptable in content. Course credit hours are transferred, but grades and grade points are not.

No transfer credit will be awarded until all final transcripts are received. It is the student's responsibility to see that this is done.

COLLEGE PROFICIENCY EXAMINATIONS

The New York State College Proficiency Examination Program (CPE) is a means by which students may receive college credit for specific courses by examinations, without being in residence for a course or taking structured correspondence lessons. College credit is generally awarded for a grade of "C" or better. The College also accepts credits from the College Level Examination Program (CLEP) of the College Entrance Examination Board.

EDUCATIONAL OPPORTUNITY PROGRAM

The basic goal of the Educational Opportunity Program at the College is to provide qualified students with a college education—the opportunity for personal growth and professional development. Upon completion of the program, graduates will be provided access to jobs in professional fields. The program is not designed for students who need only financial assistance. It serves students who ordinarily would not be able to attend college because of a lack of financial resources and insufficient academic preparation. To qualify, students must be New York State residents and demonstrate the potential to successfully complete the courses of study at the College.

Further information regarding the Educational Opportunity Program may be obtained by contacting the Office of Admissions.

INTERNATIONAL STUDENTS

The College accepts international students on the undergraduate level if they can satisfy all regular admission requirements. It is recommended, however, that students from foreign countries obtain their baccalaureate degree in their home country, and apply to the College as graduate students. Experience has shown that this arrangement provides for greater academic achievement and more efficient use of the student's time and funds. International students applying for admission must satisfy all of the course prerequisites for their intended major. In addition they must:

1. Demonstrate proficiency in the English language through acceptable performance on the Test of English as a Foreign Language (TOEFL) and/or the College Entrance Examination Board (CEEB) Achievement Text in English, and
2. Produce evidence of their ability to meet all their financial obligations.

Undergraduate international students must file official State University of New York foreign student admission forms. No fee is required for processing the application. Prior to international student acceptance, adequate financial resources must be demonstrated, and after acceptance health and accident insurance must be obtained before the student will be allowed to register at the College.

International students who are currently at an American college may apply for transfer to the College. They must meet all entrance requirements of international students plus those of a transfer student as listed above. Permission to transfer must be obtained from the U.S. Immigration and Naturalization Service district office having jurisdiction over the college in which the student is currently enrolled.

HEALTH EXAMINATION BOARD

Each new student is required to submit a medical history and physical examination report on a form that will be sent after the initial acceptance notice.

GRADUATE ADMISSION

Admission to graduate study may be granted only to applicants with at least a bachelor's degree from a recognized institution and whose preparation has been suitable in quality and content for the proposed field of major study. Applicants will be evaluated on the basis of the following: (1) their academic record should show at least a B or 80 percent average for the junior and senior years; (2) Graduate Record Examination aptitude scores, and, in some cases, subject matter (advanced) tests indicative of graduate study ability (see below); (3) supporting letters of recommendation; (4) a statement of specific educational and professional goals which describes the choice of degree program and the students' plan for the pursuit of the objectives in the program; and (5) other evidence of scholarly achievement and potential. Admission is selective with priority given to applicants who have high scholastic standing.

ADVANCED TESTS

Subject matter (advanced) test scores are required by the following programs:

Graduate Programs	*Advanced Test*
Chemistry	Chemistry
Environmental and Forest Biology	Biology

PROCEDURE

All applicants are required to submit Graduate Record Examination aptitude scores. This examination is offered several times each year in major cities of the world. For information on registration and scheduling write to the Educational Testing Service, Princeton, New Jersey 08540. Test scores should be sent to the Office of Academic Programs (Institutional number R2530).

The College provides a special application form for graduate work. Requests for information and applications should be addressed to the Office of Academic Programs.

INTERNATIONAL STUDENTS

Citizens of other countries with special educational objectives are accepted for graduate study in all programs. They must show satisfactory evidence that they have completed studies in their major field equivalent to those at a recognized American institution with a scholastic record equivalent to a B average in their junior and senior years. They must submit Graduate Record Examination scores as explained in the section on Admission Requirements. Also, applicants whose native language is other than English must submit scores on the Test of English as a Foreign Language (TOEFL). This requirement may be waived if the student has received a degree from an American institution. This examination is offered several times each year in major cities of the world.

For information on registration and scheduling, write to the Educational Testing Service, Princeton, New Jersey 08540, U.S.A. In submitting test scores, request that they be sent to the Office of Academic Programs.

EXPENSES

APPLICATION FEE

When a student applies for admission to an undergraduate program at any of the State University of New York units, a nonrefundable application fee of

$9 is required. More information about the fee and guidelines for exemptions is provided in the "Application Guidebook" for the State University of New York. There is no application fee for those applying for graduate study.

ADVANCED PAYMENT FEE

All admitted undergraduate students pay a fee of $50, which is credited to the student's first semester tuition. This payment should be sent to the College Business Office accompanied by the form provided by the Office of Admissions. The payment is required prior to May 1, or 30 days after acceptance, whichever is later. It is refundable up to May 1, or within that 30-day period. There is no advanced payment fee required for those accepted for graduate study.

TUITION AND FEES

The tuition and fee structure of the College of Environmental Science and Forestry covers usage of library, infirmary, physical education facilities, ROTC, special testing, and other services, as well as an assessment for student activities and charges for expendable supplies and equipment.

Tuition is charged in the following rate per semester:

Tuition Type	NYS Resident Students	Out-of-State Students
Undergraduate Matriculated		
Full-time	450.00	750.00
Part-Time	30.00/credit hour	50.00/credit hour
Graduate Matriculated		
Full-Time	700.00	900.00
Part-Time	58.50/credit hour	75.00/credit hour
Students who do *not* hold a Baccalaureate Degree		
Course Nos. 100-599	30.00/credit hour	50.00/credit hour
Course Nos. 600-999	58.50/credit hour	75.00/credit hour
Continuing Education Non-Degree students who hold a Baccalaureate Degree		
Course Nos. 100-499	30.00/credit hour	50.00/credit hour
Course Nos. 500-999	58.50/credit hour	75.00/credit hour
Maximum Total Tuition for 12 credit hours or more	700.00	900.00

STUDENT ACTIVITY FEES

In addition to tuition, the student body has voted to assess each full-time undergraduate student $24 per year to cover the cost of student activities. Full-time non-matriculated students are charged a fee of $12 per semester, and part-time matriculated students $1 per credit hour. Full-time graduate students likewise have a mandatory activity fee of $15. ESF students also pay an activity fee to Syracuse University to cover SU-sponsored activities and services available to ESF students, not duplicated by College organizations. These fees are $24.75 for full-time undergraduate and $13 for full-time graduate students. Part-time matriculated students are charged $14.50 per year payable at fall registration; part-time matriculated graduate students are charged $8 per year.

COLLEGE FEE

There is a State University of New York general college fee of $25 per year for all full-time students. Part-time student fee is $.85 per credit hour.

COMMENCEMENT FEE

A commencement fee of $10 is required at the beginning of the semester in which the degree is expected. Additional costs are incurred by graduate students for the binding, abstracting, and microfilming of theses.

TERMS OF PAYMENT

A check or money order for tuition and fees should be made payable to State University of New York College of Environmental Science and Forestry. This payment is required by the last day of the registration period and can be paid at the College's Business Office either prior to registration or during registration. A fee of $10 is charged for registering later than the established date.

HOUSING AND BOARD COSTS

ESF does not operate student residences or dining halls. These facilities are offered by Syracuse University. Specific information about available housing and board plans is available from the Office of Residence and Dining Services, Syracuse University, Syracuse, New York 13210.

In general, housing costs at SU range from $990 to $1,360 for an academic year, reflecting the diversity of available accommodations for graduate or undergraduate, single or married students. Most dormitory rooms accommodate two students and are furnished with beds, mattresses, desks, chairs, study lamps and dressers. A commercial linen service is available to those who order it. Separate dormitories are maintained for graduate students.

Furnished and unfurnished apartments are also available for both single and married students. These are located in a housing complex approximately two miles from the main campus, and are regularly serviced by a free shuttle-bus.

A variety of options on board offerings are available for all students, whether or not they reside in University dormitories. Costs range from $800 to $1,200 for an academic year.

In addition, a wide variety of living arrangements in private homes and apartment complexes is available in the Syracuse metropolitan area.

Payment for housing and board is made directly to Syracuse University.

OTHER COSTS

Students majoring in Resource Management attend a five-week Summer Session in Field Forestry at the Warrensburg Campus between the sophomore and junior years. Forest Biology majors have the option of attending this session or the Summer Session in Environmental Biology at the Cranberry Lake Biological Station at the end of the junior year. Cost for either five-week session is approximately $300 plus travel and personal expenses.

An extended field trip of up to three weeks at the end of the junior year costs approximately $200 for Wood Products Engineering students.

Field trips for Landscape Architecture students range between $125 and $150. In addition, students enrolled in the five -year Landscape Architecture program are required to spend one semester off campus. This is a self-described and student-budgeted program. Costs do not necessarily exceed those of a semester on campus, but additional costs are often incurred depending upon the location chosen.

The cost of books and supplies is approximately $200 to $400 a year. Additional costs for personal expenses, recreation, clothes and travel depend on the individual, and they may range from $500 to $700 a year.

REFUNDS

The following policies apply to tuition liability and refunds for students canceling their registration.

A student who is given permission to cancel registration is liable for payment of tuition in accordance with the following schedule:

Liability During Semester	
1st week:	0%
2nd week:	30%
3rd week:	50%
4th week:	70%
5th week:	100%

Application for refund must be made within one year after the end of term for which the tuition was paid to State University. The first day of class session is considered the first day of the semester, and Saturday of the week in which this first session occurs is considered the end of the first week for refund purposes. It is interpreted that a student who does not attend any class sessions after Saturday of the first week and who notifies the College of his intent to cancel registration on or before the second Saturday following the first day of classes will be considered to have canceled his registration during the first week.

There is no tuition or fee liability established for a student who withdraws to enter military service prior to the end of an academic term for those courses in which the student does not receive academic credit.

A student who is dismissed for academic or disciplinary reasons prior to the end of an academic term is liable for all tuition and fees due for that term.

A student who cancels registration at a unit of the State University and within the same term registers at another unit of the State University is entitled to full credit for tuition and fees paid for that term.

Notwithstanding any other provisions for refund, when a student has withdrawn through circumstances beyond the student's control, under conditions in which the denial of refund would cause undue hardship, the Chief Administrative Officer of the unit may, at his discretion, determine that no liability for tuition has been incurred by the student, provided the student has not completed more than one half of the term and has not received or will not receive academic credit for the term. Such action, including the reason for withdrawal, must be in writing.

FINANCIAL ASSISTANCE

The College of Environmental Science and Forestry offers four basic forms of student financial assistance: scholarships or grants, part-time employment, long-term loans, and assistantships for graduate students. These programs are coordinated to supplement parental support, summer work, savings, and assistance from other sources. The sources of funds for financial assistance programs, the guidelines for determining the recipients, the procedures for applying, and the method of disbursement of funds vary from one program to another. This information is presented in detail in *Financial Assistance at ESF*, a separate publication which is mailed to all applicants, and is available to the public by contacting the Office of Financial Aid.

Financial aid advisors are aware of the many problems of financing higher education and meeting day-to-day living expenses for both undergraduate and graduate students, and are available to discuss individual student problems. All students are encouraged to apply for financial aid.

HOW TO APPLY

Each year students interested in receiving financial assistance, *except for graduate assistantships*, must complete the application process. (Graduate students who wish to be considered for a graduate assistantship refer to page 37, and follow those instructions.) Two forms are necessary to apply:

1. The candidate must complete a College Application for Financial Aid Transcript and return it to the Office of Financial Aid by MARCH 15. The application is included in the publication, *Financial Assistance at ESF*. Applications will be accepted after March 15; it should be noted, however, that available funds may already be committed to other students. Applicants need not wait for notification of acceptance to the College before applying for financial aid.
2. The candidate must also complete the Family Financial Statement (FFS) available in the College's Office of Financial Aid, high school guidance, and most college financial aid offices.
3. Students are invited to discuss with the professionals in the Financial Aid Office any problems in financing their education.

This application information is based on current requirements, and financial aid systems and forms are undergoing constant change. Applicants are urged to contact the Office of Financial Aid for the latest information and requirements.

SELECTION OF RECIPIENTS

In making award decisions, consideration is given primarily to comparative financial need; however, scholastic standing, character, and potential contribution to the College community are also factors in making certain awards.

SCHOLARSHIP AND GRANT PROGRAMS

Supplemental Educational Opportunity Grants

The College is the recipient of funds authorized under Title IV-A of the Higher Education Act of 1965, as amended. These funds enable the College to award grants to undergraduate students who have high financial need. Grants range from $200 to $1,500 per year and must be matched by other awards.

ESF Educational Opportunity Grant Program

Students accepted into the College's Educational Opportunity Program may receive, in addition to other financial assistance, a special award to pay for education-related costs. Students must come from a socio-economically disadvantaged background to be eligible.

Prospective Educational Opportunity Program students must apply for financial aid when submitting their admissions applications.

Basic Educational Opportunity Grants

The BEOG Program was authorized in the Education Amendments of 1972. Grants are available to eligible full-time and half-time undergraduate students. The amount of the award can vary from $200 to $1,800.

Applications are available from high school guidance offices or any college office of financial aid. Students should submit the Student Eligibility Report (SER) to the Office of Financial Aid as soon as it is received from the processor.

Tuition Waivers for International Students

Tuition waivers may be granted each year to qualified students from foreign countries. Interested students should contact the Assistant Vice President for Academic Programs.

Regents Programs

Additional information and applications for the following programs are available from the College or:

New York Higher Education Services Corporation
Tower Building
Empire State Plàza
Albany, New York 12255

REGENTS COLLEGE SCHOLARSHIPS

High school students who are New York State residents may qualify for a $250 annual scholarship by taking a competitive exam during their senior year.

TUITION ASSISTANCE PROGRAM

These awards are available to New York State residents who are enrolled in full-time degree programs. Based on income, awards range from $200 to full tuition. Separate application is necessary.

REGENTS GRANTS OR CHILDREN OF DECEASED OR DISABLED VETERANS

These grants are awarded to children of parents who served during specific periods of war or national emergency and who died as a result of such service, or suffered a disability of at least 50 percent. The award entitles a New York State resident to $450 per year.

Vocational Rehabilitation Grants

Financial assistance and program counseling are provided by New York State for students with disabling handicaps. Information is available from any Office of Vocational Rehabilitation.

Veterans' Benefits

The Veterans' Readjustment Benefits Act of 1966 as amended enables veterans and children of deceased or disabled veterans to obtain financial aid for their college education.

Additional information and counseling are available from the Veterans' Affairs Counselor at the College. Local veterans' administration offices, or the State Regional Office, 111 West Huron Street, Buffalo, New York 14202, can provide information and application forms.

Social Security Benefits

The 1965 amendments to the Social Security Act extended the age limit for a child's benefits from 18 to 22, providing the child is a full-time student. Local Social Security offices have additional information.

Assistance for Native American Students

Native American students with financial need may be eligible for scholarship and grant assistance through programs sponsored by the federal Bureau of Indian Affairs and the New York State Education Department. For more information about the programs, students should contact the Bureau of Indian Affairs, 1951 Constitution Avenue NW, Washington, D.C., or the Native American Education Unit, State Education Department, Education Building Annex, Albany, New York 12234.

Private Fellowships, Scholarships, and Grants

The College administers a number of programs which have been established by private individuals, companies, organizations and foundations. These scholarships and grant programs have varying eligibility requirements and are awarded to students according to their respective guidelines which are described in more detail in *Financial Assistance at ESF*. The following is a list of the programs: Alumni Memorial Awards; Alumni Educational Grants; Nelson Courtlandt Brown Scholarship Fund; Henry H. Buckley Student Aid Award; New York State College of Forestry Foundation, Inc.; Mary E. Palmer Memorial Scholarship; Portia Farrell Morgan Scholarship; Phyllis Roskin Memorial Award; and Student Association grants.

Syracuse Pulp and Paper Foundation, Inc. Scholarships

Scholarships from this foundation are awarded to students in paper science and engineering. The scholarship amount is $100 more than the recipient's annual tuition charge. Incoming transfer students entering the program should request a Pulp and Paper Scholarship application from the Office of Financial Aid. It is necessary to reapply each year for the scholarship.

State University Supplemental Tuition Assistance

A limited number of small grant awards are determined annually by the College for students with financial need.

EMPLOYMENT OPPORTUNITIES

College Work-Study Program (CW-SP)

The College participates in the Federal College Work-Study Program, which provides part-time jobs during the academic year and full-time positions during the summer to students who need financial assistance to attend the College. Wages for these positions vary from $3.10 to $4 an hour.

Job Locator Service

The College coordinates and maintains lists of part-time and summer employment opportunities. Interested students should contact the Student Employment Coordinator in the Office of Financial Aid for additional information.

A part-time employment program is available to qualified veterans. More information is available from the Veterans' counselor at the College.

LOANS

National Direct Student Loans

These loans are available to students with financial need who are enrolled at least half-time. An aggregate of $6,000 is the maximum an undergraduate can borrow, and $12,000 is the aggregate a graduate student can borrow. Repayment and 4 percent interest begin six months after leaving college. Deferment and cancellation benefits are available for certain situations.

Insured Student Loans

This program is administered by the New York Higher Education Services Corporation (NYHESC) for New York State residents. These loans are available from a bank or other lending agent to students who are registered at least half-time. Undergraduates can borrow an aggregate of $12,500 for their undergraduate studies, and a graduate student can borrow an aggregate of $25,000. Repayment and 9 percent interest begin six months after leaving college (an additional 1 percent interest is paid at the time the loan is received). Applications are available at local banks.

Emergency Loans

The College is able to provide registered students interest-free, short-term loans. These loans are available because of the interest and support of the following donors: Alumni Association Short-term Loan Fund; C. Ives Gehring Memorial Fund; Milton Hick Memorial Fund; James D. Judson Memorial Fund; David B. Schorer Memorial Fund; and Edward Vail Emergency Fund.

Students should contact the Office of Financial Aid when need arises for a short-term loan.

GRADUATE ASSISTANTSHIPS

Assistantships are awarded to students of demonstrated scholarship and whose education and experience enable them to assist in laboratory instruction and research. The amounts of the assistantships range from $3,366 to $5,000 per year. In addition, tuition is waived. Students who hold an assistantship must be enrolled for full-time study.

Beginning graduate students may apply for assistantships on their application for admission, and continuing graduate students should consult with their major professors.

ACADEMIC POLICIES

The following academic policies are extracted from the complete undergraduate and graduate policies which are contained in the *Student Handbook*. The *Student Handbook* is available from the Office of Student Affairs, 105 Bray Hall.

UNDERGRADUATE AND GRADUATE POLICIES

Published Requirement

Students must satisfy the requirements for graduation in effect at the time of their first matriculation as a student. Students may graduate under the requirements stated subsequent to those in effect at their matriculation, but they may not use prior ones.

Attendance

Students are expected to adhere to the attendance policy stated by each course instructor. Instructors may make attendance part of the course requirement.

Audits

Students may informally audit ESF courses with the permission of the course instructor. No record will be maintained of the informal audit nor will any grade be assigned. No fee is required for informal audits.

Students may formally audit courses with the permission of their major professor and the course instructor. They may not be used to satisfy any graduation requirements. Formally audited courses will appear on the student's transcript and will be graded either "SAU" (satisfactory audit) or "UAU" (unsatisfactory audit). The grade will be assigned based on the criteria for audit established by the course instructor.

Withdrawal from ESF

Students who withdraw on or before the "drop date" for a semester will have their records marked "(date): Withdrawal." Courses will appear for that semester with the grade of "W".

Students who withdraw after the "drop date" for a semester, but before the semester ends, will have either "WP" (withdraw passing) or "WF" (withdraw failing) listed after each such course.

Students who withdraw from the College and in the future wish to return must apply for readmission.

Prior to withdrawal from ESF, students must schedule an interview in the Office of Student Affairs.

Statement of "Good Academic Standing"

The term "in good academic standing" means that a student is eligible or has been allowed to register for and undertake academic coursework at the College for the semester in question. In some instances the College may define a student as being "on academic probation." The mechanism of academic probation, including any accompanying constraints upon a student's activities, is intended merely as an educational device designed to encourage greater effort on the part of students who appear to be having difficulty in meeting certain academic standards. Placement on academic probation may precede denial of the right to register for academic coursework if certain conditions are not met, but a student on academic probation is considered to be in good academic standing. Any question concerning whether or not an individual student is in good academic standing will be determined by the College Academic Affairs Committee.

UNDERGRADUATE POLICIES

Credit Hour Load

To be classified as full-time, an undergraduate student must register for at least 12 credit hours during a semester. A student may not register for more than 18 credits during a semester unless permission from the student's advisor is obtained.

Evaluation

For each course completed, one of the following grades will be awarded:

Grade	*Definition*	*Grade Points*
A		4.0
A-	Excellent	3.7
B+		3.3
B	Good	3.0
B-		2.7
C+		2.3
C	Passing	2.0
C-		1.7
D	Minimum Passing	1.0
F	Failure	0
I/F, I/U	Unresolved Incomplete	0

Under conditions defined elsewhere, the following grades may be assigned, none of which yield grade points:

Grade	*Definition*
W	Withdraw
WP	Withdraw Passing
WF	Withdraw Failing
SAU	Audit (Satisfactory)
UAU	Audit (Unsatisfactory)
I	Incomplete

Grade Point Averages

Semester and cumulative averages are computed by dividing the total grade points earned by the total credit hours completed, i.e., all courses graded "A - F."

Academic Honors

DEAN'S LIST

Students who carried 12 or more credits of coursework graded "A - F" and earned a minimum grade point average of 3.00 will be placed on the Dean's List for that semester.

Graduation Honors

Students will be graduated with the appropriate honor if the following criteria have been met:

A minimum of 30 credits of ESF and Syracuse University courses have been completetd as a matriculated, upper-division student.

A grade point average of: 3.00 - 3.33, *cum laude*; 3.34 - 3.82, *magna cum laude*, 3.83 - 4.00, *summa cum laude.*

Academic Dismissal

Undergraduate students who earn less than a 2.00 cumulative grade point average shall have their records reviewed by the appropriate College-wide faculty committee which may delegate this authority. Based upon this review, students with less than this minimum cumulative grade point average will be placed on either academic probation or dismissed from ESF. The decision on probation or dismissal will be based upon an overview of the total academic record and the mathematical possibility for attaining a 2.00 cumulative average by the projected graduation date.

When extraordinary conditions contributed to the academic dismissal of students, such students may submit a written appeal to the dismissal decision to the Office of Academic Programs. These appeals will be reviewed by the appropriate faculty committee which will decide either to sustain the dismissal or place the students on probation. There is no appeal beyond this committee.

Students who have been dismissed for academic performance may not reapply until at least one semester has elapsed.

Students dismissed a second time for academic performance may not again be considered for readmission.

Graduation Requirements

Undergraduate students are responsible for meeting the following requirements for graduation:

A. Matriculated status as an undergraduate student.
B. All course requirements must be satisfied.
C. A minimum cumulative grade point average of 2.00 (4.00 = A) for all courses taken as a matriculated student at ESF.
D. At least 24 of the last 30 credits must be registered through ESF.
E. Consistent with the State Education Department requirements, a total of at least 120 credits from courses accepted as transfer credit by ESF and courses successfully completed while a matriculated student at ESF.

GRADUATE POLICIES

Master's Credit Hours

A minimum of 30 credit hours of graduate level work is required for the master's degree. This degree shall represent completion of at least one academic year of graduate-level study or an equivalent that can be shown to accomplish the same goals.

Doctoral Credit Hours

For the doctorate, credit hour requirements vary depending on the student's background and specific degree program. Early in a student's program the coursework requirement will be established which is intended to provide the student with the required level of competency to satisfactorily complete the doctoral candidacy examination. The doctorate shall represent completion of at least three full-time academic years of graduate study beyond the baccalaureate degree or an equivalent that can be shown to accomplish the same goals.

Doctoral Research Tool Requirement

There is no College-wide requirement for languages or other tools of research for doctoral students. However, the faculty of any program may establish such requirements.

Time Limit

Students must complete all requirements for the master's degree within three years of the first date of matriculation. For the doctoral degree, students must complete all requirements for their degree within three years of satisfactory completion of the doctoral candidacy examination or they will be required to retake the candidacy examination.

Credit Hour Load

A graduate student must be registered for at least one credit each semester, excluding summers, from the first date of matriculation until all degree requirements have been completed. Failure to register will indicate the student no longer wishes to pursue a graduate degree.

Although there is no full-time requirement for degree purposes, there is such a requirement for those who qualify for a tuition waiver and for some other forms of financial support. For these students the following definition applies:

With a master's degree, or the completion of 24 or more credits after the bachelor's degree, students holding an assistantship are considered full-time if they are registered for nine or more credits. All other students are considered full-time if they carry 12 or more credits. All graduate students in landscape architecture must carry 12 or more credits to be considered full-time.

Evaluation

For each course completed, one of the following grades will be awarded.

Grade	*Definition*	*Grade Points*
A		4.0
A-	Excellent	3.7
B+		3.3
B	Passing	3.0
B-		2.7
C+		2.3
C	Minimum Passing	2.0
C-		1.7
F	Failure	0
I/F, I/U	Unresolved Incomplete	0

Under conditions defined elsewhere, the following grades may be assigned, none of which yield grade points:

Grade	*Definition*
W	Withdraw
WP	Withdraw Passing
WF	Withdraw Failing
S	Satisfactory
U	Unsatisfactory
SAU	Audit (Satisfactory)
UAU	Audit (Unsatisfactory)
I	Incomplete

Grade Point Averages

Semester and cumulative averages are based on graduate level courses only and are computed by dividing the grade points earned by the credit hours completed, i.e., all courses graded "A - F".

Master's Study Integration

Students enrolled in a master's degree program are required to demonstrate the ability:

A. to critically evaluate, organize, analyze, and synthesize the coursework and other components of their program of study;
B. to relate these components to current concepts and issues in their chosen field and associated disciplines;
C. to work logically and independently; and
D. to communicate effectively.

Thesis requirements may be met by successful completion of one of the following three options. The faculty of any program may limit the number of permissible options for its students. As permitted by their program, students will choose and follow one option with the approval of their major professor and with the guidance of their steering committee. Each option must be designed to satisfy the above requirements.

OPTION 1. THESIS OR PROJECT AND DEFENSE

Scope. Under this option, in addition to completion of necessary coursework, students must prepare either:

1. a research-oriented thesis which investigates a problem that expands or clarifies knowledge in the field, with generalizable results, or
2. an application-oriented project which applies skills or techniques from the field to a specific problem.

Whichever is chosen, students are required to define an appropriate problem for investigation; review relevant information sources; develop a study design; collect, organize, analyze, and interpret data; and draw conclusions.

Product. The thesis or project must be documented in a thorough and appropriate format and style. It must be in a permanent form, which may consist of print or non-print materials.

Credits. Students must satisfactorily complete 6 to 12 credits for the investigation leading up to completion of the document. These credits will be graded on an "S/U" basis. Students must register for the approved number of credits for their investigation sometime during the three-year limit for the master's degree. They may register for more than the approved number of credits for their investigation, but the excess credits may not be used to fulfill the minimum 30 credits required for the master's degree.

Defense Examination. The thesis or project must be successfully defended.

OPTION 2. ACADEMIC OR PROFESSIONAL EXPERIENCE AND MASTER'S COMPREHENSIVE EXAMINATION

Scope. Under this option, in addition to completion of necessary coursework, students must engage in an academic or professional experience which applies, enriches, and/or complements the more formal coursework of their plan of study. This option might include, but not be limited to, an internship or an independent study experience. Whatever the form of the option, its objectives, organization, procedure, and manner of documentation must be submitted in writing and be approved by the student's major professor and steering committee before the experience is begun.

Product. This experience must be reported in a thorough and appropriate format and style. It need not be in a permanent form.

Credits. Students must satisfactorily complete 6 to 12 credits for this experience. These credits will be graded on an "S/U" basis. Students must register for the approved number of credits for their experience sometime during the three-year time limit for the master's degree. They may register for more than the approved number of credits for their experience, but the excess credits may not be used to fulfill the minimum 30 credits required for the master's degree.

Master's Comprehensive Examination. At the completion of their plan, students must successfully pass a comprehensive examination covering the major field, allied fields, and the content of their completed experience.

OPTION 3. COURSEWORK AND MASTER'S COMPREHENSIVE EXAMINATION

Scope. Under this option, students must satisfactorily complete a minimum of 42 hours of graduate level coursework appropriate to their field of study. As in other options, the design and sequencing of the coursework plan must be conducted with the guidance and approval of the student's major professor and steering committee.

Product. No product is required beyond that required for individual courses.

Credits. Students must satisfactorily complete a minimum of 42 credits of graduate level coursework. Students must complete these required credits sometime during the three-year time limit for the master's degree.

Master's Comprehensive Examination. At the completion of their plan, students must successfully pass a comprehensive examination covering the major field and allied fields.

Doctoral Thesis

Nature and Purpose

A thesis must be completed and successfully defended in order for the doctoral degree to be awarded. The doctoral thesis is the final and most important component of the series of academic experiences which culminate in the awarding of the Ph.D. degree. Three major functions are fulfilled by the thesis experience: (1) It is a work of original research or scholarship which makes a contribution to existing knowledge; (2) It is an educational experience which demonstrates the candidate's mastery of research methods and tools of the specialized field; and (3) It demonstrates the student's ability to address a major intellectual problem and arrive at a successful conclusion.

Examinations

Doctoral Preliminary Examination

An examination may be required of those admitted into a doctoral program to ascertain their level of understanding of the basic principles and techniques necessary to function effectively in that program. The results of the preliminary examination will be used to guide the major professor and the student in determining the appropriate coursework necessary to complete that requirement for the doctorate.

The format for the examination will be determined by the faculty in the program involved. It is recommended that the examination be primarily written with a supplemental oral presentation. When a preliminary examination is required it should be conducted as early as possible in a student's program, at least before the completion of the student's second semester.

Doctoral Candidacy Examination

A student admitted into a doctoral program must satisfactorily complete a candidacy examination covering the major field and, in a broader manner, allied fields in order to be advanced into the status of doctoral candidate.

The purposes of the doctoral candidacy examination are to determine the student's knowledge of factual material and ability to use this knowledge creatively and intelligently.

The doctoral candidacy examination must be taken when the majority of coursework is completed but before the student begins serious thesis investigation. The candidacy examination must be passed at least one year before the student may present a thesis for defense.

Defense Examination for Thesis or Project

All graduate students who are required to complete a thesis or project must successfully defend it and have it accepted by the College.

The purposes of the defense examination are to determine the validity and significance of the data; and evaluate the student's understanding of investigative methods, ability to critically analyze data, and ability to relate the study results to the appropriate field and to more general scientific principles and knowledge.

Academic Dismissal

Graduate students who earn less than a 3.00 cumulative grade point average or who earn two grades of "U" shall have their records reviewed by the College Academic Affairs Committee, which may delegate this authority. Based upon this review, students either will be placed on academic probation or will be dismissed from ESF. The decision on probation or dismissal will be based upon an overview of the total academic record, the mathematical possibility for attaining a 3.00 cumulative average by the projected graduation date, and the recommendation from the major professor, program coordinator, and school dean or program director.

When extraordinary conditions contributed to the academic dismissal of students, such students may submit a written appeal to the dismissal decision to the Office of Academic Programs. These appeals will be reviewed by the College Academic Affairs Committee, which will decide either to sustain the dismissal or place the students on probation. There is no appeal beyond this committee.

Students who have been dismissed for academic performance may not reapply until at least one semester has elapsed.

Students dismissed a second time for academic performance may not again be considered for readmission.

Graduation Requirements

Graduate students are responsible for meeting the following requirements for graduation:

A. The student must be in a matriculated status as a graduate student.

B. The approved academic plan for each student must be completed within the applicable time limit.

C. For the doctoral degree, the student must be admitted to candidacy and a thesis completed and successfully defended.

D. A minimum cumulative grade point average of 3.00 (4.00 = A) for all graduate level courses taken during the program of study at ESF must be achieved.

E. Consistent with the State Education Department requirements, a total of at least 30 graduate credits is required for the master's degree and, for the doctorate, at least three full-time academic years of graduate study beyond the baccalaureate degree or an equivalent that can be shown to accomplish the same goals.

STUDENT LIFE

HOUSING

The College of Environmental Science and Forestry does not operate its own residence facilities or food service. Students enter into a Room and Board Agreement with Syracuse University, which is adjacent to the State-operated College. Contracts for room and board made with Syracuse cover a full academic year (fall and spring semesters) and are not normally renegotiable during that time period.

Students have a choice of living centers at Syracuse University—large halls, apartment houses, cottages, fraternities and sorority houses, or cooperative units. Graduate student resident advisors live on each floor or in each unit and are available for counseling, advisement, and referral services.

Syracuse University also has housing units available for married students and their families. While veterans are given preference, nonveterans can usually find housing.

Students who wish to live off campus may contact Alternative Action Services (ALTERACTS), a student-run housing organization at Syracuse University. An extensive listing of available housing in the Syracuse area is provided free of charge.

FOOD SERVICE

All undergraduate students living in Syracuse University housing (except those in University apartment, co-ops, and fraternities and sororities) are required to be on a University board plan. Different board plans exist to help meet varying nutritional needs of individual students. The College does not provide a food service program; however, a snack bar is available for the convenience of students. The Nifkin Lounge Snack Bar is located in the basement of Marshall Hall and is open from 8:30 a.m. to 3:30 p.m. during the academic year.

EXTRACURRICULAR ACTIVITIES

Students at the College of Environmental Science and Forestry have many extracurricular activities to choose from, both on campus and in the community.

At the College

ESF upper division students elect class officers annually, and the *Student Association* is the official representative body governing extracurricular affairs.

Among the departmental organizations which offer students an opportunity to broaden their knowledge and to meet other students with similar interests are: *Archery Club* for those interested in field archery; a *Basketball Club*; *Bob Marshall Club*, an organization of students concerned about the future of the Adirondack Mountains; the *Forestry Club*, the traditional sponsor of the intercollegiate Woodsmen's Team; *Botany Club*; *Mollet Club*, an organization of landscape architecture students; the *Recycling Club*; the *Papyrus Club*, organized by paper science and engineering students as a way to keep up with new developments in the industry; and the *Zoology Club*, which sponsors lectures, films, and field trips.

Other groups on campus include *Saengerbund*, the College singing group; and *Alpha Xi Sigma*, senior honorary society. There are also student chapters of the *Wildlife Society*, the *Society of American Foresters*, the *American Fisheries Society*, the *American Water Resources Association*, the *Forest Products Research Society, the American Society of Landscape Architecture*, the *Association of General Contractors*, and the *Technical Association of Pulp and Paper Industries (TAPPI).*

The two major student publications at ESF are the *Knothole*, a weekly newspaper, and *The Empire Forester*, an annual yearbook which has won many awards in past years.

Graduate student activities are the responsibility of the Graduate Student Association. A slate of officers is elected annually to coordinate academic enhancement, social, and service programs.

Recent GSA-sponsored activities include a lecture series, a College-wide urban wildlife course, a traditional fall picnic, and various social functions designed to encourage interaction between graduate students and College faculty.

At Syracuse University

Students at the College of Environmental Science and Forestry have all the privileges of Syracuse University students: participation in student government, organizations, sports, and other extracurricular activities.

Men and women at the College participate in all Syracuse University intercollegiate sports, club sports, and intramurals. Archbold Gymnasium on the Syracuse University campus is the center of athletics and physical education. Additional indoor facilities are provided through Manley Field House and the new Carrier Dome which is the site of Syracuse University home football and basketball games. Facilities at Skytop recreation area include ski tows and a ski jump, a lodge, and 22 tennis courts. The Women's Building offers instructional, social, and recreational facilities. All full-time undergraduate women are eligible to participate in intercollegiate competition in tennis, field hockey, volleyball, basketball, swimming, and diving.

Students are provided with many opportunities for acquiring musical training and performing experience through the Syracuse University Band, (Symphonic Band, Wind Ensemble, Stage Band, Concert Band and Jazz Workshops), the Syracuse University Orchestra, and the Syracuse University Chorus.

Membership is allowed in all Syracuse University student groups, including a wide variety of clubs, the International Student Association, religious and military organizations, and professional and honor societies.

In the Syracuse Area

The City of Syracuse and its surrounding countryside offer many cultural, educational, and recreational opportunities. The city has several fine museums, including the Everson with its outstanding collection of works by local, regional, and international artists; a local repertory theater; several points of historical interest; a professional symphony orchestra; and a Civic Center which attracts artists from around the world.

Eight parks lie within the city limits, numerous county and state parks, including Beaver Lake Nature Center and Montezuma Wildlife Reservation are within a short drive.

COLLEGE SERVICES

Career and Counseling Services

The Office of Career and Counseling Services is available throughout the student's college career as a place where they may seek, at any time, the advice of experienced counselors. This office should be the first contact when questions or personal problems arise. Most student problems can be dealt with in one or two brief contacts. The most severe problems requiring extensive assistance are referred to the cooperative facilities at Syracuse University and/or specialized agencies in Syracuse.

The Office is designed to provide additional assistance to students throughout the year to help them adjust to and successfully graduate from ESF. Through various presentations, counseling sessions, group activities and workshops, students are given the opportunity to further develop such skills as decision making, reading, studying, and test taking. Additional programs deal with coping with adjustments related to transferring colleges and exploring relationships between academic pursuits and career objectives.

Special efforts are made to assist students identified as having academic difficulties or adjustment problems. Often personal and academic problems are associated with career decisions. A key component of this office is to provide a variety of opportunities through resource materials, presentations, job development, and counseling to meet the individual needs of each student at his/her various stages of career readiness. Some career services offered through this Office are skills development workshops; lists of full-time, part-time, and summer jobs; on campus recruiting; advanced study information; career newsletters; reference information; a library out-reach program; and an alumni job list.

Each year this office conducts a Placement Survey to monitor the success and progress of our college graduates. The reports are shared with the college community and made available to the public upon request. The following is a brief summary for the classes of 1978, 1979.

Of the 565 graduates from the *Class of 1978*:

(48%)	271	were employed in their major field of study
(12.5%)	71	were employed out of their major field of study
(19.1%)	108	were entered in an advanced study program
(4.6%)	29	were still available for employment
(15.5%)	88	were unavailable for employment or did not respond

Of the 517 graduates from the *Class of 1979*:

(48.7%)	252	were employed in their major field of study
(10.8%)	56	were employed out of their major field of study
(23.0%)	119	were entered in an advanced study program
(3.8%)	20	were still available for employment
(13.7%)	70	were unavailable for employment or did not respond

Health and Medical Facilities

Students may consult a physician for medical care or health advice at the Syracuse University Student Health Service. Full-time students are entitled to unlimited visits to the out-patient clinic and also 10 days of confinement per college year with ordinary medical care in the infirmary. Infirmary usage over 10 days will be at prevailing infirmary rates. Some laboratory examinations, if necessary for treatment or diagnosis of common illness, are provided without cost. Most common legal drugs are provided at a minimal charge.

A student accident or sickness insurance plan, available at fall registration, not only supplements the usual infirmary privileges, but is also a health protection plan during the summer months when students are not under the care of the Health Service. Married students with dependents who are not covered by Health Service privileges are strongly urged to provide themselves and their families with special insurance made available to University students. *All international students are required to carry health and accident insurance.*

SU Speech and Hearing Clinics

The Gebbie Speech and Hearing Clinics provide remedial assistance to all regularly enrolled students who may be handicapped by hearing, speech and voice disorders. This service is free to students.

SU Psychological Services and Research Center

Students desiring an analysis of their aptitudes, abilities and interests may secure special testing programs at the Testing and Evaluation Service Center on the Syracuse University campus.

SU Reading and Language Arts Center

The Syracuse University School of Education, in cooperation with the College of arts and Sciences and the Psychological Services and Research Center, maintains a reading and language arts center for research in the learning skills and for training teachers and specialists in reading and language arts. Representatives from the fields of medicine, speech and psychology cooperate in making diagnoses and in planning remediation. Large numbers of University students use this facility to improve their reading skills.

SU ROTC Opportunities

Students attending the College are eligible to participate in the Army or Air Force ROTC Program at Syracuse University.

ROTC at Syracuse University consists of both 4- and 2-year programs. Students attending the College for two years can gain admission to either the Army or Air Force program through participation in summer training. Both six week and four week camps and on-campus programs are available to suit individual needs.

The ROTC programs offer academic instruction, alternate and supplementary career opportunities, leadership experience and financial aid.

ESF Alumni Association

The Alumni Office serves as the liaison between the College, the Alumni Association Board of Directors and more than 6,000 alumni. The Association supports educational programs through scholarships, publishes a quarterly newsletter and represents alumni concerns.

ESF Student Rules and Regulations

The complete listing of guidelines for all students attending ESF is found in a separate publication, the *Student Handbook*, which is distributed at registration. Also distributed at registration are copies of "Rules and Regulations of Conduct and Behavior" which pertain to all members of the College community. It is the student's responsibility to be familiar with these regulations and abide by them.

DEGREE PROGRAMS AND AREAS OF STUDY

The College awards degrees in the following programs:

School of Biology, Chemistry and Ecology

Chemistry; B.S., M.S., Ph.D., with areas of study in biochemistry, natural products chemistry, environmental chemistry, or natural and synthetic polymer chemistry.

Environmental and Forest Biology; B.S., M.S., Ph.D., with areas of study in ecology, entomology, environmental physiology, fish and wildlife biology and management, pathology and mycology, pest management, plant science, soil ecology, or zoology.

Interdepartmental area of study in chemical ecology; M.S., Ph.D.

School of Forestry

Resource Management—General Forestry; B.S.

Resource Management and Policy; M.S., Ph.D., with areas of study in forest management, recreation management, policy and administration, forestry economics, quantitative methods, or land use planning.

Silviculture and Forest Influences; M.S., Ph.D., with areas of study in silvics, silviculture, forest soil science, tree improvement, or forest influences.

Interprogram areas of study in urban forestry or international forestry; B.S., M.S., Ph.D.

School of Forest Technology

Forest Technology; A.A.S.

School of Environmental and Resource Engineering

Forest Engineering; B.S.

Paper Science and Engineering; B.S.

Wood Products Engineering; B.S., with options in building construction, or forest products in which emphasis may be chosen in marketing, production systems engineering, or wood science.

Environmental and Resource Engineering: M.S., Ph.D., with areas of study in forest engineering, paper science and engineering, or wood products engineering.

School of Landscape Architecture

Environmental Studies, B.S.

Landscape Architecture; B.L.A.

Landscape Architecture; M.L.A., with areas of study in social/behavioral studies, natural/physical applied sciences, or design process, methods and management.

College-Wide Program

Graduate Program in Environmental Science; M.S., Ph.D., with areas of study in environmental education/communication, environmental assessment and impact analysis, environmental land use planning, water resources, or environmental science.

THE SCHOOL OF BIOLOGY, CHEMISTRY AND ECOLOGY

STUART W. TANENBAUM, *Dean*

The School of Biology, Chemistry and Ecology offers two curricula which support environmental science and forestry through the Department of Environmental and Forest Biology and the Department of Chemistry.

ENVIRONMENTAL AND FOREST BIOLOGY

JOHN B. SIMEONE, *Chairman*

The Department of Environmental and Forest Biology provides students with a firm foundation in basic biology in association with the principles of forest ecosystems and environmental science. It encompasses a variety of interconnected disciplines which concern themselves with living systems. It treats not only the form, function, and evolution of organisms, but their life requirements, tolerances, and interactions that are central to the stewardship of renewable natural resources and the maintenance of an environment of acceptable quality.

Effective management and protection of forests and related natural resources is increasingly dependent upon the understanding of living systems relative to productivity and tolerance to environmental impacts caused by the activities of man. Therefore, basic knowledge of biology is prerequisite to desirable practices and sound regulations for optimizing both the development and use of natural resources while avoiding deleterious impacts.

The critical importance modern society places upon the utilization of natural resources and the quality of our environment adds new and increasingly diverse dimensions to the services a well-trained biologist can render. The department is committed to meet this dynamically changing array of opportunity through diverse courses enriched by an active program of research that focuses upon upper-level undergraduate and graduate study. Through the addition of selected electives to a required core, undergraduates may focus their program toward a special biological field (see p. 56) or toward future graduate study. Graduate students may develop a course of study under the guidance of a major professor and graduate committee within any of several study concentrations (see p. 59).

In general, these academic programs attempt not only to stimulate interest in the recognition and understanding of traditional organismal taxa such as plants, animals, and protists, but deal as well with understanding the dynamic changes in biological systems which can be best ascertained in the context of the broad fields of ecology, physiology, evolution, and genetics. This understanding is accomplished by an integration of coursework with a strong research program, much of which is concerned with natural resource management and improvement of the quality of man's environment.

Undergraduate Program

The curriculum for the Bachelor of Science degree is built around a core of required courses which provide the student with a general education, an orientation to forestry, and a basic background in the principles of the biological and the physical sciences. Its design develops breadth in biology as well as depth in a selected biological field. Thus, although individual course selections around the required core may vary, all students major in biology and each, with an assigned advisor, develops a special plan of study.

A total of 125 credit hours, 60 of them prior to matriculation, is required for the Bachelor of Science degree. In addition to the core courses specified below, at least 21 hours in biology must be completed and, of these, at least 15 are to be from courses given in the College of Environmental Science and Forestry. These courses should be compatible with the intended concentration of study and must be at the 300 level or above. Six of the 21 credit hours must involve subject matter in plant science (courses designated FBO) and six in animal science (courses designated FEN, FZO), both exclusive of the five-hour summer field requirement. The balance of the required hours are chosen in consultation with the advisor.

Lower Division Courses

The curriculum facilitates transfer of freshman and sophomore credits from other institutions. To assume training in residence at the junior level, entering students should have successfully completed a minimum of 60 credits which include:

Course Area	*Credit Hours*
*General Chemistry with Laboratory	8
Organic Chemistry with Laboratory	8
*General Physics with Laboratory	8
Mathematics proficiency, through Integral Calculus	3-8
English	6
**Social Sciences—Humanities	9-12
*General Botany and Zoology **OR** General Biology with Laboratory	8
Biology Electives	3-6
TOTAL MINIMUM LOWER DIVISION CREDITS	60

*To enter at the junior level, a student must have completed at least these courses prior to registration.

**A course in technical writing and/or speech is recommended as part of the Social Science—Humanities group.

Upper Division Courses

Junior Year

			Credit Hours
First Semester	FBO 315	Dendrology	3
	FBL 320	General Ecology	3
	FEN 350	Elements of Forest Entomology	3
	Electives		6
			15
Second Semester	APM 491	Introduction to Probability and Statistics	3
	ERM 345	Soils **OR** GOL 105 Earth Science	3
	FBL 330	Principles of General Physiology	3
	Electives		6
			15

SUMMER FIELD EXPERIENCE—Must be met as described below 5

Senior Year

			Credit Hours
First Semester	Electives		15
Second Semester	FBL 470	Principles of Genetics	3
	FBL 471	Genetics Laboratory	1
	Electives		11
			15

TOTAL MINIMUM UPPER DIVISION CREDITS 65

A total of 125 credit hours is required to complete the B.S. degree in environmental and forest biology.

SUMMER FIELD EXPERIENCE

The curriculum requires that between the junior and senior year each student completes a minimum of five semester credit hours or its equivalent during five weeks' residence in an approved academic program in field biology. This requirement can be met by the appropriate selection of courses in Environmental Biology at the Cranberry Lake Biological Station (CLBS) where six to eight courses are offered during each of two five-week sessions (see p. 57). Earning five credits at one session satisfies the requirement; any additional courses taken in the other session count as elective credits.

One of the following alternatives to the CLBS program may instead be selected to fulfill the summer field requirement:

Alternative 1

Students desiring an experience in the principles and practices of professional forestry should attend the five-week Summer Session in field Forestry at the Pack Forest, Warrensburg Campus. Field instruction at this Campus emphasizes subject matter in dendrology, forest ecology, surveying, mensuration, and cartography.

Alternative 2

Other Biological field stations may be attended to earn the minimum five semester hours credit or its equivalent during a five-weeks' term of junior-senior level coursework. Petitions requesting this alternative must have appended course descriptions and program contemplated and be submitted no later than one month prior to the end of the spring semester preceding the summer program. A current file of alternative stations and course descriptions is maintained by the Curriculum Director.

Alternative 3

FBL 420, Field Experience-internship, under professional supervision may be authorized when containing a major academic-learning component and when thoroughly planned and well documented. It must be related to and supportive of the indicated career goal. The student must receive advance agreement from a member within the Department of Environmental and Forest Biology faculty to guide, collaborate, evaluate a work plan for the summer, and later assign a grade and credits to the internship. The plan must be submitted at least one month prior to the end of the spring semester and must be approved by the Curriculum Director.

Electives

General requirements for graduate study and a wide range of federal, state, municipal, and private biology positions are met by the curriculum. Through skillful selection of electives, the student may prepare for special biological fields related to natural resources or the environment. Those

training for biological positions in federal and state service should review Civil Service publications and become familiar with specific course requirements early enough to make timely elective choices. Students planning to meet special requirements for Federal Civil Service positions in forestry may do so by electing 10 credits in forestry courses and attending the Summer Session in Field Forestry at the Warrensburg Campus. Students are urged to use some elective time to enhance their communications skills. Courses in technical writing, applied communications or a language (as approved by their faculty advisor) are useful.

Special Biological Fields

Plant Science. Students may prepare for a wide variety of opportunities in the botanically oriented professions. Essential to understanding plants are their biochemical and physiological processes; their interactions with the environment and with one another; with animals and other organisms; their genetic makeup, evolution and classification. Requirements may be satisfied for such professional areas as botany, plant ecology, tree genetics, plant physiology, horticulture, tree maintenance, or plant quarantine.

Forest Pathology and Mycology. Protection of vascular plants and wood products from invading organisms, such as fungi, is basic to forest productivity, effective wood product use, and the maintenance of environmental quality. Program strength is in the ecological, physiological, genetic, and environmental aspects of disease. Students may train for positions in forest pathology, mycology, pest management, plant quarantine, or diagnostic laboratories. Opportunities for employment exist with federal, state, and private agencies.

Entomology. Insects play significant roles, both beneficial and detrimental, in their interactions with man, his resources, and his environment. Several courses are available on insect life and functions that enable a student to fulfill requirements of Civil Service and a variety of other employers. Program strengths are in forest entomology, medical entomology, pest management, and environmental toxicology.

Fish and Wildlife Biology and Management. A basic and applied program in fish and wildlife biology, including management and behavior, is provided for the student whose objectives are to develop professional skills in the biology and management of these natural resources.

Zoology. A basic and broad program is provided for the student whose objectives are to go on for graduate study or to further training in such subjects as physiology, soil invertebrate ecology, animal behavior, or animal ecology. Some opportunities with federal and state agencies are available at the baccalaureate level.

Ecology. Students are offered the opportunity to develop ecological skills in a number of areas. However, one's career potential is enhanced when ecological study is combined with knowledge of a major taxonomic group such as higher plants, microbes, or animals, including vertebrates or invertebrate forms such as insects, or with another unifying science such as physiology, biochemistry, genetics, or environmental chemistry.

Pest Management. Modern control of insects and disease dictates practices appropriate to maintaining an acceptable environmental quality. Through proper selection of courses, a student is able to achieve training that will result in wise selections of methods for an integrated approach to pest management. Training is more than adequate to prepare students for state examinations required for pesticide applicator's certification.

Silvics. Manipulation of forest ecosystems for human benefit relies upon strong preparation in biology. Students may combine plant sciences, silviculture, pathology, entomology and other courses to lead either to graduate study in silviculture or to forestry positions in industry or in municipal, state, or federal government.

Program in Environmental Biology

Cranberry Lake Biological Station
Cranberry Lake Campus
Cranberry Lake, New York

Students in the Environmental and Forest Biology curriculum generally satisfy their summer requirement by attending either session of the Summer Program in Environmental Biology at the Cranberry Lake Biological Station. Courses at the Station are senior-level offerings designed to come after the junior year spent on the Syracuse Campus. Students elect three courses during the five-week period and earn five semester-hours credit; any extra credits earned by attending both sessions count toward elective hours in biology. Students from other institutions are welcome, provided space is available.

Cranberry Lake and its environs are ideally suited for an advanced biology summer program. The surrounding topography is rolling hill and lake country dotted with numerous small ponds, closed bogs, and stream drainages. The lake itself is the third largest body of water in the Adirondacks. Because 80 percent of the shoreline is in State ownership, the lake remains relatively unspoiled by recreational developments and is free of pollution problems. Much of the original forest cover in the region was harvested years ago; today a rich variety of community types occupy those sites as the vegetation reverts again to the natural forest condition. The remaining virgin forests also provide the student with many examples of

stable forests, each type reflecting the particular environmental conditions controlling forest development. A wealth of wildlife parallels the variety of cover types over the region. The area is centrally located, providing easy access to a wide range of additional ecosystems ranging from bog to alpine types.

Facilities include four classroom-laboratories; dining facilities capable of serving 120; faculty quarters and cabins; an administration building; 12 cabins housing 6-8 students each; a recreation hall; and several smaller, supporting buildings.

The 10-week program extends from mid-June into mid-August and is divided into two five-week sessions. Courses are taught in blocks of 2½-day units, permitting concentrated study without hourly interruptions. These courses are designed to emphasize and effectively utilize the unique nature of this Adirondack setting, and all involve field trips each day into the surrounding forest and aquatic ecosystems. The scheduling of these courses* remains fairly constant from year to year.

SESSION I. FBO 417 Adirondack Flora, FBO 427 Bryoecology, FZO 424 Vertebrate Ecology, FZO 427 Field Ornithology, FEN 450 Forest and Aquatic Insects, FBL 421 Ecology of Freshwaters, FBO 460 Field Problems in Forest Pathology, FBL 400 Forest Techniques for Biologists, FBL 498 Independent Research.

SESSION II. FBO 428 Wetland Plant Ecology, FBO 465 Field Mycology, FZO 424 Vertebrate Ecology, FZO 475 Animal Behavior, FZO 423 Microcommunity Ecology, FEN 460 Insect Ecology and Behavior, FOR 441 Forest Influences, FBL 400 Forest Techniques for Biologists, FBL 498 Independent Research.

Room, board, and fee charges are approximately $60.00 per week. Students wishing more information about the Summer Program in Environmental Biology may obtain a copy of the *Station Handbook* from the Director, Cranberry Lake Biological Station, State University of New York College of Environmental Science and Forestry, Syracuse, New York 13210.

---

*See pages 138, 139, 141, 151, 156, 162, and 163 of this catalog for further descriptions of these courses.

Graduate Program

The graduate program in Environmental and Forest Biology is organized in nine interdependent biological study concentrations that provide comprehensive coverage within specific interest areas. Each concentration is governed by indicated faculty who define the scope of subject matter, recommend acceptance of students and guide them in a course of study. Some of these concentrations follow taxonomic lines while others are broad unifying areas basic to all taxa; one includes faculty of both Chemistry and Environmental and Forest Biology Departments. Students choosing to emphasize a taxonomic category should explore the desirability of engaging to some extent in the broader interdisciplinary areas. Similarly, it is often considered opportune for students enrolled in the latter to develop a degree of specialization in at least one taxon as a means of assuring a useful mix of talents. Those students whose interests are not served by the designated areas of concentration should explore the feasibility of alternate routes of study, provided the needed expertise is available, and they may be guided by faculty listed in the concentration nearest the student's interest.

Most students seeking the M.S. degree include in their study plan a research thesis and its defense. There also is an option to earn the degree with 42 hours of coursework, the latter specified by the student's advising faculty according to concentration core requirements. All who seek the Ph.D. must include original research and dissertation or its equivalent in the form of referred publications.

The major center of activity is Illick Hall, with the laboratories, classrooms, controlled spaces, and equipment that one would expect in a modern, five and one-half-storied building in which 85,000 square feet of working space is available for graduate study and research. Laboratories, many of them temperature and temperature-humidity controlled, and one sound-controlled, are provided for diverse study: plant development, physiology,tissue culture, biochemistry and toxicology, ecology, animal behavior, and similar endeavors. An herbarium, mycological collections, insect and other arthropod collections, and the Roosevelt Wildlife Collection of vertebrates are maintained in archival condition as useful resources for the academic program. Eight rooftop glasshouse units, three of them air-conditioned and one incorporated into a five-room indoor-outdoor insectary, are important to the full array of interests in plant science and plant-animal interactions.

Also available to the Department's students and faculty is a variety of sophisticated instrumentation: convenient access to a computer center; radio-isotope counting equipment, including liquid scintillation spectrometer and Cobalt-60 source; diverse analytical equipment and measuring devices; gas-liquid chromatography; and, in collaboration with the Chemistry Department, a comprehensive analytical expertise. The Nelson C. Brown Center for Ultrastructure offers scanning and transmission electron microscopy capability.

Supportive to the program are the academic resources, including courses, of Syracuse University, SUNY's Upstate Medical Center and the several campus facilities described elsewhere in this catalog. Our students participate as well in courses and utilize faculty and facilities at Cornell University in cooperative exchanges.

Excellent field sites and facilities are available for research in all aspects of the program in nearby or moderately distant locations from the Syracuse campus. In addition to the College's several campuses and field stations that offer a broad diversity of forest types, sites, and conditions, there are New York State Department of Environmental Conservation lands, the Montezuma National Wildlife Refuge, the Adirondack Mountains, and the transition zones near Lake Ontario, Oneida Lake, and Cicero Swamp that collectively offer a variety of habitat diversity from highlands to aquatic-terrestrial zones. The ponds, streams, and lakes in Central New York and the St. Lawrence River are regularly used by graduate students in wetlands and aquatic ecology and fishery biology.

Further academic advantages stem from the urban setting of the Syracuse campus. The Greater Syracuse area provides a convenient laboratory for studies basic to urban forestry: the growth and protection of woody vegetation, greenspace maintenance, the utilization of waste beds for plant growth, the detoxification of pollutants, and the restoration of terrain stripped of vegetation. Disposal of industrial and human pollutants and wastes require deeper understanding of the role of plants, animals and microorganisms in the biodegradation of organic matter. The conversion of organic materials into useful fuel, into additives for plant growth, or into protein feeds for domestic animals, to name a few, are stimulating study-in-depth of many elements of basic biology while at the same time offering substantial assistance toward the solution of pressing human problems.

Of the nine available study concentrations, eight are contained within the department: *Ecology, Entomology, Environmental Physiology, Fish and Wildlife Biology and Management, Pathology and Mycology, Plant Science, Soil Ecology*, and *Zoology*. One concentration is shared with faculty of the Chemistry Department: *Chemical Ecology*.

Ecology

ALEXANDER (Vertebrates, Wetlands), ALLEN (Forest Insects), BEHREND (Wildlife), BROCKE (Wildlife, Bioenergetics), CHAMBERS (Wildlife), DINDAL (Invertebrates), GEIS (Plants, Wetlands), KETCHLEDGE (Dendrology, Bryology), KURCZEWSKI (Insect Behavior), MITCHELL (Invertebrates, Bioenergetics), MORRIS (Diptera), MULLER-SCHWARZE (Vertebrates, Behavior), PORTER (Vertebrate Ecology), RAYNAL (Higher Plants, Taxonomy), RINGLER (Fishery Biology), SCHAEDLE (Plant Nutrition), SHIELDS (Vertebrate Behavior), SIMEONE (Forest and Wood-boring Insects), TIERSON (Wildlife), VAN DRUFF (Wildlife), WERNER (Limnology).

Understanding relationships between living organisms and their abiotic and biotic environment is fundamental to environmental science which also encompasses man's role in ecological systems. Ecology is an integrative science which depends on an understanding of ecological theory, habitat characteristics, and the basic biological attributes of organisms. This concentration area encourages the incorporation of this knowledge into those areas of practical concern. Specific research may entail the study of: distribution and abundance of organisms; community structure including trophic relationships, diversity or succession; and ecosystem properties such as patterns of energy transfer and biogeochemical cycling.

Entomology

ABRAHAMSON (Forest Insects, Pest Management), ALLEN (Forest Insects, Population Ecology), BREZNER (Physiology), KURCZEWSKI (Morphology, Taxonomy, Behavior), LANIER (Forest Insects, Pheromones, Cytotaxonomy), MILLER (Pest Management), NAKATSUGAWA (Toxicology), NORTON (Spiders and Mites, Insect Larval Taxonomy), SIMEONE (Forest and Wood-inhabiting Insects).

Adjunct Faculty

HOWARD (Medical Entomology), JAMNBACK (Diptera Ecology and Control), MORRIS (Medical Entomology), NAPPI (Physiology, Pathology).

Graduate study opportunities are most often found in the basic aspects of insect life and the role of insects in relation to man and his environment. The wide range of effects stemming from insect activity, from the beneficial to the deleterious, allows for a variety of research subjects in which insects play a major role. Thesis topics may concern insects affecting forests, shade trees and wood products, those relating to the health and well-being of man and those playing key roles as biotic parasites and predators of pest

species. Current research areas include population dynamics of forest defoliators, pheromone communications among beetles and moths, speciation of insects as understood through behavioral and cytogenetic study, biological control of insects of forest and public health importance and basic biochemistry of insect detoxification mechanisms.

Environmental Physiology

BREZNER (Insect Physiology), CASTELLO (Plant Virology), GRIFFIN (Fungus Physiology), HARTENSTEIN (Invertebrate Physiology), MITCHELL (Environmental Energetics), NAKAS (Microbial Physiology), NAKATSUGAWA (Insect and Vertebrate Toxicology), SCHAEDLE (Plant Physiology), WALTON (Plant Physiology), WILCOX (Plant Physiology).

Graduate study may include courses according to chosen academic goals, and research may include functional and molecular areas. Of current interest are mechanisms of action of plant growth hormones; biochemical regulation of seed germination; plant and microbial enzymology and virology; toxic action and detoxification of insecticides by vertebrate and invertebrate animals; production and action of plant phytoalexins and antibiotics; plant defenses against phytophagous invertebrates; mycorrhizae, ion transport, mineral nutrition, cambial physiology, and photosynthesis.

Fish and Wildlife Biology and Management

ALEXANDER (Vertebrates, Herpetology), BEHREND (Vertebrates), BROCKE (Vertebrates), CHAMBERS (Vertebrates), PAYNE (Ornithology), PORTER (Vertebrate Ecology), RINGLER (Fisheries Biology), TIERSON (Vertebrates), VAN DRUFF (Vertebrates, Ornithology), WERNER (Limnology).

Study in this area provides students with advanced preparation at both the M.S. and Ph.D. levels in biological concepts of fish and wildlife populations, particularly as they relate to the proper management of these important resources. Widespread and increasing concern for management of these wild animal resources has been matched by strong student interest in educational programs which prepare them for careers in the fish and wildlife professions. Graduate education, such as is available through this study area, is rapidly becoming a universal prerequisite to employment as a professional fisheries or wildlife biologist.

Areas of research include wetland ecology and management of wetland species, population-habitat relationships, predator ecology, urban wildlife relationships, endangered species studies, feeding ecology of fishes, stream ecology, ecology of larval fishes and homing behavior of fishes.

Forest Pathology and Mycology

CASTELLO (Forest Pathology), GRIFFIN (Fungus Physiology), MANION (Forest Pathology), NAKAS (Microbiology), WANG (Mycology), WILCOX (Mycorrhizae), ZABEL (Forest Pathology and Wood Deterioration).

The study area in Forest Pathology and Mycology seeks to train students interested in developing an expertise responsive to the increasing pressures on forest and shade tree systems for wood fiber, public services, and amenities. This requires new sophisticated levels of disease understanding, disease control, a broad knowledge of fungi, bacteria and viruses, their environmental impacts and their roles in biodeterioration. Areas of staff interest and expertise appropriate for graduate student research emphasis include: environmental, fungal and viral tree diseases; mycorrhizae; wood decay and biodegradation processes; monitoring and impact assessment of disease in forest and urban tree systems; chemical and biological control of tree diseases; epidemiology of tree diseases and the genetics of resistance to tree diseases and to pathogen variability; physiology of fungus growth and development; taxonomy and biology of decay and imperfect fungi; fungus ultrastructure.

Plant Science

CASTELLO (Virology), GEIS (Ecology), GRIFFIN (Mycology, Fungus Physiology), KETCHLEDGE (Ecology, Bryology), MANION (Pathology), NAKAS (Microbiology), RAYNAL (Ecology, Taxonomy), SCHAEDLE (Physiology), TEPPER (Anatomy, Morphogenesis), VALENTINE (Genetics), WALTON (Physiology), WANG (Mycology), WILCOX (Physiology, Mycorrhizae), ZABEL (Pathology, Wood Deterioration).

Adjunct Faculty

AMES (Physiology), FAUST (Taxonomy), KARNOWSKY (Genetics), SETLIFF (Mycology).

Plants, as the principal energy source for ecological food chains, serve as the structural and functional foundation of natural and managed ecosystems. The plant science concentration provides opportunity for study in a broad range of specialties fundamental to the understanding of plants and their interaction with other organisms, emphasizing both forest and related plant systems. Current faculty and student research interests include: dynamics of plant communities as affected by man and the environment; mechanisms of plant succession; epidemiology of forest and urban tree diseases; decay, discoloration and biomodification of wood; taxonomy, physiology, growth and ultrastructure of fungi; heritability of wood properties and disease resistance of trees; biochemistry and physiology of plant growth regulators; photosynthesis; mineral nutrition; mycorrhizae; bryoecology; morphogenesis in shoot and root systems; and plant tissue culture.

Soil Ecology

DINDAL (Invertebrates), HARTENSTEIN (Invertebrates, Physiology), MITCHELL (Invertebrates, Energetics), NAKAS (Microbiology), NORTON (Invertebrates, Taxonomy), GRIFFIN (Fungus Physiology), WANG (Mycology), WILCOX (Mycorrhizae), ZABEL (Wood Biodegradation).

Soil ecology includes the study of interrelationships of soil-inhabiting organisms (as individuals, populations and communities) with their biotic, chemical, and physical environments. This field can be considered to be a frontier of science because of the myriad of undescribed species of soil-dwelling arthropods, nematodes and annelids, and the wealth of incompletely understood symbiotic relationships that can be readily discovered by students in this concentration. Soil ecology deals with fundamental aspects of biodegradation and nutrient cycling and is therefore important for improvements in crop culture and enlightened waste disposal.

The soil ecology concentration is supported by courses in physical aspects of soils, plant and animal taxonomy and general ecology.

Zoology

ALEXANDER (Vertebrates, Wetlands), CHAMBERS (Wildlife Ecology, Management), DINDAL (Invertebrates), HARTENSTEIN (Physiology, Invertebrates), MITCHELL (Invertebrates, Bioenergetics), MULLER-SCHWARZE (Vertebrate Behavior), NORTON (Arachnology), RINGLER (Fishery Biology), SHIELDS (Vertebrate Behavior), VAN DRUFF (Wildlife Ecology), WERNER (Limnology, Aquatic Ecology).

Adjunct Faculty

BROWN (Wildlife).

Zoology provides opportunity for in-depth coursework and fundamental research in morphology, physiology, taxonomy, and behavior of invertebrate and vertebrate animals. As one of the basic areas in the Department of Environmental and Forest Biology, Zoology is supportive of other concentrations such as Ecology, Fish and Wildlife Biology and Management, and Soil Ecology. Graduate studies in Zoology include both basic and applied research on animals of our natural ecosystem, including their associated soils and waters.

CHEMISTRY

KENNETH J. SMITH, *Chairman*—(Physical and Polymer Chemistry), CALUWE (Organic Polymer Chemistry), CAMPBELL (Phytoenzymology), FLASHNER (Biochemistry), JOHNSON (Environmental Chemistry), LALONDE (Organic and Natural Products Chemistry), LEVIN (Physical and Polymer Chemistry), MEYER (Nuclear Chemistry), SARKO (Physical and Polymer Chemistry), SCHUERCH (Wood and Polymer Chemistry), SILVERSTEIN (Ecological Chemistry), SMID (Physical and Polymer Chemistry), TIMELL (Wood Chemistry).

The academic program in chemistry enables the student to develop not only an understanding of chemical phenomena, but also an appreciation for chemistry that can link it to the biological and applied sciences. Programs include courses in traditional areas of chemistry, with additional study in those fields pertaining to environmental science and forestry. This broad spectrum of academic offerings is possible through close cooperation with Syracuse University, where a wealth of accessory courses at both the undergraduate and graduate levels are available. Emphasis on the investigative function of chemical science is manifest in the wide array of ongoing research projects within the department.

The Department of Chemistry offers the following areas of concentration leading to the Bachelor of Science degree:

Biochemistry and Natural Products Chemistry

Environmental Chemistry

Natural and Synthetic Polymer Chemistry

Students in all options, by selecting proper electives, may be certified on graduation as having completed an American Chemical Society approved curriculum. All options are excellent grounding for professional work at the B.S. level or for advanced graduate study.

Undergraduate Program

Lower Division Courses

For students transferring into the College as juniors, recommended courses consist of 68 credits or an associate degree and include:

Course Area	*Credit Hours*
Biology with Laboratory	8
General Chemistry with Laboratory	8
Organic Chemistry with Laboratory	8
Physics with Laboratory	8
Economics	3
English	6
Language, Literature or Communication	6
Electives	12-15
*Mathematics	6-9
TOTAL MINIMUM LOWER DIVISION CREDITS	68

*Mathematics through integral calculus. An additional mathematics course beyond integral calculus is required for the B.S. degree.

Upper Division Courses

Junior Year			*Credit Hours*
First Semester	FCH 325	Organic Chemistry III	4
	[3]CHE 332	Quantitative Analysis	2
	CHE 333	Quantitative Analysis Lab	1
	FCH 360	Physical Chemistry	3
	[1]Professional Elective		2-4
	Elective		3
			15-17
Second Semester	[2]Math or Elective		3
	FCH 380	Instrumental Methods	3
	FCH 361	Physical Chemistry	3
	CHE 357	Physical Chemistry Lab	2
	FCH 384	Spectrometric Identification of Organic Compounds	1
	[1]Professional Elective		2-3
	Elective		3
			17-18

[1]A sequence of professional electives should be chosen in the junior year. In addition to the freshman biology courses, a student whose emphasis is in biochemistry must take 3 semester hours of genetics and at least one other 3-semester-hour biology course. A student whose emphasis is in natural products must take 3 semester hours of biology in addition to the freshman biology courses and an additional hour of organic chemistry laboratory (FCH 496) and a second hour of FCH 384.

[2]One course of mathematics or applied mathematics beyond MAT 397, or equivalent, is required.

[3]CHE designations refer to courses offered at Syracuse University.

Biochemistry and Natural Products Chemistry Option

This option is designed for students who wish to approach problems in the life sciences with the tools and point of view of the chemist. In addition to a major concentration in the several branches of chemistry, the student obtains a solid grounding in the fundamentals of physics, mathematics, and biology. Professional electives can provide a minor concentration in botany, ecology, entomology, zoology, or physiology. Collaborative efforts of chemists and biologists are providing new solutions to problems of environment, natural resources, and health.

Senior Year			*Credit Hours*
First Semester	LIB 300	Library Research	1
	FCH 495	Introduction to Professional Chemistry	1
	FCH 571	Wood Chemistry I	2
	FCH 574	Wood Chemistry Lab	1
	FCH 530	Biochemistry I	3
	FCH 531	Biochemistry Lab	2
	[1]Elective		3
	Elective		3
			16
Second Semester	[2]FCH 498	Introduction to Research	5
	FCH 497	Undergraduate Seminar	1
	FCH 532	Biochemistry II	3
	FCH 573	Wood Chemistry III	2
	Elective		3
	Elective		3
			17
		TOTAL MINIMUM UPPER DIVISION CREDITS	64

[1]Introduction to Polymer Science, FCH 450 (3 credit hours) is suggested.
[2]Petition by student to Department for replacement of this requirement will be considered to allow time for special interest.

A total of 133 credit hours is required to complete the B.S. degree in chemistry with the biochemistry and natural products option.

Environmental Chemistry Option

The environmental chemistry option is designed for those students who wish to obtain a solid fundamental background in chemistry which will enable them to make a strong contribution towards the identification and solution of problems in the areas of pollution, air and water quality, analysis and basic research in environmental chemistry. A large number of professional electives, available through course offerings of other departments such as biology and engineering, provide the important interface with other disciplines necessary for a working understanding of the complex problems inherent in environmental studies.

Senior Year			*Credit Hours*
First Semester	LIB 300	Library Research	1
	FCH 495	Introduction to Professional Chemistry	1
	FCH 571	Wood Chemistry I	2
	FCH 574	Wood Chemistry Lab	1
	FCH 510	Aquatic Environmental Chemistry	3
	[1]Professional Elective		2-3
	[2]Elective		3
	Elective		3
			16-17
Second Semester	[3]FCH 498	Introduction to Research	5
	FCH 410	Chemistry of Pollution	1-3
	FCH 497	Undergraduate Seminar	1
	FCH 573	Wood Chemistry III	2
	Electives		6
			15-17
		TOTAL MINIMUM UPPER DIVISION CREDITS	63

[1]A wide variety of courses offered by the departments of chemistry, environmental and forest biology, forest engineering and resource management is available to supplement the environmental chemistry concentration.
[2]Biochemistry I, FCH 530, (3 credit hours) is suggested.
[3]Petition by student to Department for replacement of this requirement will be considered to allow time for special interest.

A total of 131 credit hours is required to complete the B.S. degree in chemistry with the environmental chemistry option.

Natural and Synthetic Polymer Chemistry Option

This option is designed for students interested in the structure and physical properties of man-made and natural materials, the giant molecules of wood, plastics, polysaccharides, proteins, rubbers, and fibers. The recently discovered chemistry of these materials constitutes one-half the concern of the chemical industry and is the origin of a major revolution in our way of life and our understanding of nature. This special subject area is an advanced core of studies beyond the basic courses of the classical undergraduate chemistry curriculum.

Senior Year			*Credit Hours*
First Semester	LIB 300	Library Research	1
	FCH 495	Introduction to Professional Chemistry	1
	FCH 550	Introduction to Polymer Science I	3
	FCH 551	Polymer Techniques	2
	FCH 571	Wood Chemistry I	2
	FCH 574	Wood Chemistry Lab	1
	[1]Elective		3
	Elective		3
			16

			Credit Hours
Second Semester	[2]FCH 498	Introduction to Research	5
	FCH 552	Introduction to Polymer Science II	3
	FCH 497	Undergraduate Seminar	1
	FCH 573	Wood Chemistry III	2
	Electives		6
			17
		TOTAL MINIMUM UPPER DIVISION CREDITS	64

[1]Biochemistry I, FCH 530 (3 credit hours) is suggested.
[2]Petition by the student to Department for replacement of this requirement will be considered to allow time for special interest.

A total of 133 credit hours is required to complete the B.S. degree in chemistry with the natural and synthetic polymer option.

Graduate Program

Recent years have seen profound advances in the fundamental knowledge of chemical areas which have special significance for forestry and the environment. The following research areas have received active attention by both faculty and graduate students in the programs: polymer chemistry and physics; wood chemistry; environmental chemistry; biochemistry; chemistry of natural products, including ecological chemistry; and materials sciences.

Requirements for a master of science or doctor of philosophy degree in chemistry include a research project and thesis, along with an appropriate program of courses at the College and at Syracuse University.

Specific projects may vary from year to year, since they reflect the current interests of the faculty. Current research projects with *physiochemical* emphasis are: the chemistry, physics, solid-state and solution properties of natural and synthetic polymers, including studies in thermodynamics, statistical mechanics, crystallization, morphology, elasticity, conformation of macromolecules, optical properties, polymer catalysis, mechanism of polymerizations, polyelectrolytes, ion binding to macromolecules and ion pairing; chemistry of free radicals, radical ions and charge transfer processes; structure and properties of ionic solutions in nonaqueous media; crystal structure and morphology of cell wall constituents; heavy metal speciation. Current *organic* chemistry programs deal with synthesis of special polymers such as high temperature aromatic block, stereoregular vinyl polymers, and polysaccharides, various aspects of natural products chemistry, but especially alkaloids and terpenes, isolation and characterization of insect and mammalian attractants. An active program on the structure and topochemistry of the *polymeric* wood components, hemicelluloses, lignins and celluloses is underway. In *biochemistry*, department members are studying mechanisms of action of plant growth hormones, biochemical regulation of seed germination, plant enzymology and ultrastructural plant cytology.

Graduate research laboratories in the Hugh P. Baker Laboratory are well equipped for polymer studies, chemical, and biochemical research. Instrumentation includes analytical and preparative ultracentrifuges, Warburg respirometer, recording infrared and ultraviolet spectrophotometers, mass spectrometer, differential refractometer, electron spin resonance spectrometer, nuclear magnetic resonance spectrometers, automatic membrane osmometers, solid-and solution-state light scattering photometers, recording polarimeter and optical dispersion spectrometer, analytical and preparative high performance liquid chromatographs, combined gas chromatographs—mass spectrometry center, spectrofluorimeter, several ultramicrotomes, electron microscopes, X-ray diffraction, instrumentation chromatography and cold laboratories, and radiochemical laboratories with counters for solids, liquids and gases.

INTERDEPARTMENTAL AREA OF STUDY

The following concentration in chemical ecology is offered in collaboration with faculties of the Department of Environmental and Forest Biology and the Department of Chemistry. Interested students should apply to the department of major interest, which will have prime responsibility for setting requirements. Faculty from both departments can aid in the development of a plan of study enabling a student to acquire sophisticated skills in either chemistry or biology and an ample understanding of the other to grapple with problems requiring an understanding of both.

Chemical Ecology

LANIER (Insect Pheromones), LALONDE (Aquatic Plant Secondary Substances), MULLER-SCHWARZE (Vertebrate Pheromones), SILVERSTEIN (Pheromone Chemistry), SIMEONE (Insect Pheromones), TANENBAUM (Microbial Chemistry).

As a relatively new interdisciplinary endeavor, workers in this field attempt to understand organismal interactions, both intra- and interspecific, mediated by chemical substances such as hormones, pheromones, kairomones and phytoalexins. These occur at all taxonomic levels: between uni- and multi-cellular organisms, microbes and plants, plants and plants, plants and animals, microbes and animals, animals and animals. Study of such interactions has been accelerated in recent years through joint efforts of biologists and chemists in meaningful research accompanied by a growing body of literature.

THE SCHOOL OF ENVIRONMENTAL AND RESOURCE ENGINEERING

WILLIAM P. TULLY, *Dean*

The School of Environmental and Resource Engineering offers three undergraduate curricula and one graduate program which support the engineering aspects of environmental science and forestry through the Department of Forest Engineering, the Department of Paper Science and Engineering and the Department of Wood Products Engineering. A Bachelor of Science degree is awarded in each of these fields while advanced degrees (M.S. and Ph.D.) are offered through the graduate program in Environmental and Resource Engineering.

The undergraduate curricula provide students with a broad base of study and specialized education in engineering, science, and technology. Students learn to apply their education to improve the economic use of forest and rural resources, to enhance environmental quality and to increase the efficiency of processes and the wise use of water and timber, wood, paper, and related fibrous material products. Graduates are prepared for a variety of careers in industry and government service in these fields.

The specific requirements for entering each curriculum at the junior level and for completing the coursework residency requirements for the B.S. degree are described with the individual departmental programs which follow. The principles and professional skills of engineering analysis and design are developed in the courses appropriate for each curriculum as well as through informal contacts which are facilitated by the advantageous student/faculty ratio.

Qualified applicants with associate degrees in engineering science or an appropriate blend of science and mathematics usually gain full admission at the junior level. Graduates of two-year technology programs also may qualify for junior standing in certain curricula if their previous studies included the courses appropriate to departmental requirements.

Graduate Program

The Graduate Program in Environmental and Resource Engineering is based on a synthesis of the professional activites of the three curricular areas described above. Both the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees are offered. The program provides students with a balanced understanding of scientific research, engineering measurement, and engineering analysis and design, and with specialized depth and appropriate interdisciplinary breadth of knowledge in environmental and resource engineering. Its graduates are prepared for professional careers in specialized aspects of environmental and resource engineering and to become leaders in the private and public sectors of research, engineering, technology, teaching and administration relevant to the needs of society and, in particular, the industries and professions served by this program.

In its broadest sense this program is concerned with the application of science and engineering to the development and improved utilization of the natural environment and its forest-related resources. Thus, graduate education is understood to involve a wide range of scientific and engineering abilities and attitudes.

Specialized areas of study have been delineated to serve student interests. Within these areas of study, an individually-designed study program is developed for and with each student. A partial listing of specialized areas of graduate study and research include: Wood science and technology, composite materials and wood treatments, design of timber structures, tropical timbers, anatomy and ultrastructure, pulp and paper technology, fiber and paper mechanics, chemistry of pulping and bleaching, colloid chemistry and fiber flocculation, chemical process engineering, pollution abatement engineering, forest engineering, water resources engineering, transportation and soils, energy and environmental quality, and remote sensing and photogrammetry.

Other related specialized areas of study may be identified when appropriate to both faculty and resource capabilities of the program and particular student needs. The specialization noted for each faculty member within the description for each department gives further indications of the possibilities offered.

Applicants to the graduate program in Environmental and Resource Engineering must meet general College-wide requirements, have prior education or experience suitable for beginning advanced study in their chosen area of specialization and have a deep commitment to the advancement of the academic and professional aspects of their career goals. Some coursework deficiencies may be corrected within individual study programs.

Candidates for the Master of Science degree must complete a program of study totaling at least 30 hours of credit earned through graduate level coursework. Six to 12 of these credits shall be given for a master's thesis or project. Up to six credit hours of graduate level coursework may be transferred from another institution.

The Ph.D. program usually builds upon a master's degree and demands further advanced mastery of material in the area of study and the dissertation topic. This includes additional graduate level coursework beyond the M.S. degree as determined with the student's committee.

Candidates for the Ph.D. must demonstrate competence in at least two of the following tools of research (statistics, computer programming or foreign language), pass a doctoral candidacy examination, and write and defend a dissertation.

Students are able to draw on the combined resources of the three academic departments in the School. In addition, courses and facilities of other schools of the College as well as Syracuse University complement those of the School of Environmental and Resource Engineering.

Prospective students who desire more information than is presented for each of the departmental descriptions and specialties described should contact the Dean, School of Environmental and Resource Engineering.

FOREST ENGINEERING

ROBERT H. BROCK, *Chairman* (Photogrammetric and Geodetic Engineering, Mapping Systems)

DUGGIN (Agricultural Assessment, Remote Sensing, Physics), HOPKINS (Surveying, Site Assessment, Remote Sensing), LEE (Computers and Systems Engineering, Transportation and Equipment, Soil Mechanics), McCLIMANS (Soils, Hydrology, Site Engineering), PALMER (Engineering Economics, Energy, Production and Harvesting Systems), TULLY (Structures, Engineering Hydrology, Water Resources).

A large portion of our nation's resources exist on forested and rural lands. These include: the increasingly valued renewable resources of timber, biomass and wildlife; the sustaining resources of water, soil and nutrients; and the derivative resources of paper, wood, and fibrous products and recreation and amenity values. Forest engineering is a unique field of engineering which is concerned with the design of systems and facilities to improve the sustained high quality yield of resources and multiple use benefits of goods and services from forested and rural lands.

The undergraduate curriculum in Forest Engineering provides a broad base of study and specialized education in engineering with an emphasis on site development for improved resource use and conservation. Instruction focuses on: locating and quantifying resources; designing harvesting, conveyance and transportation systems and networks for water and timber; designing structures, facilities and pollution abatement systems; and engineering planning for the development of sites and regions for multiple use.

Programs of advanced studies toward an M.S. or Ph.D. degree in environmental and resource engineering are offered. Individually designed programs provide graduates with sufficient understanding of the methodologies of scientific research and of the principles of engineering analysis or design to work with competence in resource related research, engineering design and management. There are opportunities for individuals who seek advanced education in such areas as water resources engineering, photogrammetry and remote sensing, transportation and soils, energy and environmental quality as well as forest engineering.

Because of the special importance of continual measurement and evaluation of the broad scaled parameters which affect the resource base, unique opportunities for study are available for students aiming toward professional careers involving the conceptualization, design, and maintenance of geographically referenced resource information systems. This includes elements of surveying, photogrammetry, remote sensing, and resource information systems design.

Undergraduate Program

The primary objective of this curriculum is to prepare qualified engineering graduates to operate with professional competence within the context of forest and natural resources development. The curriculum includes basic, forest, and engineering sciences. It utilizes elements of traditional engineering disciplines and develops its unique aspects from interweaving engineering design with an understanding of the natural environment and its renewable resource base including water, soil, timber, wildlife, and amenity values. Studies in the humanities and social and economic sciences are integrated throughout the curriculum to help achieve a broad and balanced perspective of professional practice in forest engineering.

Qualified graduates in search of advanced degree education enjoy ready acceptance to engineering graduate schools throughout the country. Graduates of the Forest Engineering curriculum may enter an established five-year program in either civil, industrial, or mechanical engineering at Syracuse University. A bachelor of science degree in engineering will be awarded by Syracuse University upon completion of the requirements of the fifth year.

To enter this curriculum at the junior level, a transferring student must have acceptable college credit in the following coursework areas or be able to have suitable coursework substitutions for courses listed in the junior and senior years.

Lower Division Courses

Course Area	*Credit Hours*
Biology (Botany preferred) with Laboratory	4
General Chemistry with Laboratory	8
Physics with Laboratory	8
Calculus through Differential Equations	15
English	6
Economics (Macro- and Microeconomics)	6
Engineering Drawing (Graphics)	1
Computer Programming (FORTRAN or APL)	3
Engineering Mechanics (Statics)	3
*Engineering Science Electives (Dynamics or Electrical Science)	3
Humanities or Social Science Electives	3
TOTAL MINIMUM LOWER DIVISION CREDITS	60

Students must meet these minimum requirements, and they are encouraged to exceed the minima in the elective areas, to facilitate scheduling during the upper division years.

Upper Division Courses

Junior Year			Credit Hours
First Semester	FEG 300	Introduction to Forest Engineering and Design	2
	FEG 371	Surveying for Engineers	3
	FOR 321	General Silviculture	3
	CIE 327	Principles of Fluid Mechanics	4
	*Elective in Engineering Science (Electrical Science I recommended)		3
	**Elective in Dendrology or Wood Structure and Properties		2-3
			17-18
Second Semester	FEG 340	Engineering Hydrology and Flow Controls	4
	FEG 350	Introduction to Remote Sensing	2
	FEG 363	Photogrammetry I	3
	ERE 362	Mechanics of Materials	3
	IOR 326	Statistics for Engineers	3
	Elective		3
			18

Senior Year			Credit Hours
First Semester	FEG 410	Structures I	4
	FEG 422	Production Systems Engineering	4
	FOR 477	Resource Policy and Management	3
	CIE 437	Soil Mechanics and Foundations I	4
	**Elective	Engineering or Technical Forestry	2-3
			17-18
Second Semester	FEG 437	Transportation Systems	4
	ERE 440	Water Pollution Engineering	3
	ERE 488	Engineering Economics	1
	FEG 489	Forest Engineering Planning	3
	***Elective in Engineering Design Sequence		3
	Elective		3
			17
		TOTAL MINIMUM UPPER DIVISION CREDITS	69

ELECTIVE DISTRIBUTION

Humanities or Social Sciences: At least 9 credit hours must be elected in social sciences or humanities, at least 6 of which are recommended to be upper division.

**Engineering Sciences*: At least 6 credit hours to be chosen from:

Dynamics (mandatory unless at least 2 credit hours of coverage is included in lower division mechanics coursework)	(3)
Electrical Science I	(3)
Thermodynamics	(3)
Engineering Materials	(3)

***Technical Electives*: At least 5 credit hours to be chosen from:

Dendrology	(3)
Wood Structure and Properties	(2-3)
Summer Program in Field Forestry	(6)
Free engineering or technical forestry elective	(3)

****Engineering Design*: At least 3 credit hours in upper division engineering design or synthesis coursework as part of an advisor approved sequence which complements other forest engineering coursework, such as:

Photogrammetry II
Survey Systems Design
Structures II
Soil Mechanics II
Hydrologic and Quality Controls
Air Pollution Engineering
Production Systems II
Synthesis of Mechanical Systems

A total of 129 credit hours is required to complete the B.S. degree in forest engineering.

Graduate Program

Graduate studies and research are primarily concerned with environmental and resource related programs. Individual study programs leading to the master of science and doctor of philosophy degrees are available to meet the student's needs and interests in graduate study. Successful programs of graduate study may be efficiently designed by students with bachelor of science degrees in engineering or in forestry, natural sciences, physics, or mathematics.

Study programs with emphasis on environmental and resource engineering measurements may be designed in remote sensing, photo interpretation, geodetic engineering, analytical photogrammetry and photogrammetric systems. Programs emphasizing engineering analysis and design are available in water resources, energy, transportation, harvesting and site engineering systems. Included are the monitoring, measurement and evaluation of physical parameters affecting water, soil, timber, vegetation, and wildlife.

Support for graduate study and research in these areas is both internal and external. The internal support includes modern laboratory and instrumentation facilities in the Engineering Schools at both ESF and at Syracuse University. Exceptional departmental support exists for programs in environmental engineering measurements in the form of remote sensing and photogrammetric laboratories and the extensive forest properties owned by the College at which research may be conducted.

External support comes from several active sources, including industrial, commercial and governmental. Over the past two decades, close cooperation has developed special study and research opportunities with these sources.

PAPER SCIENCE AND ENGINEERING

BENGT LEOPOLD, *Chairman* (Organic Chemistry and Mechanical Properties of Fibers and Paper)

BAMBACHT (Pulping, Papermaking, Paper Machine Operation), BRITT (Chemistry of Paper Formation), DENCE (Organic Chemistry, Pulping, Bleaching), GORBATSEVICH (Pulping, Bleaching, Paper Technology and Paper Properties), JELINEK (Computer Applications, Process Engineering, Thermodynamics), LUNER (Surface and Colloid Chemistry of Papermaking Systems), MARK (Mechanical Properties of Fibers and Paper), MARTON (Mechanical and High-Yield Pulping), ROTHENBERG (Pulping, Bleaching), STENUF (Chemical Engineering, Instrumentation, Thermodynamics, Flow Phenomena, Process Control, Corrosion), THORPE (Fiber Physics, Paper Physics and Mechanics), TURAI (Water and Air Pollution Abatement Engineering, Materials Science and Engineering).

Outstanding for its vigorous growth and diversity of products, the pulp and paper industry is the fifth largest in the nation and exceptionally strong worldwide. Its need for professional men and women with training in science, engineering and technology is increasing even more rapidly than the industry itself. The College pioneered instruction in this area in 1920 with the organization of the paper science and engineering department, which has maintained a singularly high position in professional education for the continuing development of the pulp, paper and allied industries. Its graduates, who are in constant demand, occupy positions of leadership throughout the world.

The curriculum in Paper Science and Engineering is designed to provide a broad base of study and to prepare students for a variety of careers in the paper and related industries. Excellent opportunities are provided for men and women qualified to fill positions as research chemists, process engineers, technical service representatives, line management personnel, and many others.

The program provides education in the physical sciences and chemical engineering, with specific emphasis on those aspects of these disciplines which relate to the manufacture of pulp and paper. This includes the chemistry and anatomy of wood, the conversion of wood to pulp and paper, and the chemistry and physics of paper and paper formation. Instruction in chemical engineering includes a foundation of unit operations basic to the pulp and paper industry, as well as specialized courses, such as water and air pollution engineering.

The department is located in Walters Hall, opened in 1969. This facility is devoted exclusively to education and research in the field of pulp and paper. In addition to a large number of special purpose laboratories and highly sophisticated scientific equipment, the department maintains an experimental pulp and paper mill equipped with machinery and instrumentation for studies of pulping, pulp purification, reuse of secondary fibers, refining, paper additives, and papermaking. This facility includes one 12-inch and one 48-inch fourdrinier paper machine, a number of disk refiners, and a two-pocket grinder for mechanical pulping, and auxiliary equipment. In addition, the Department maintains an environmental engineering laboratory designed to demonstrate various methods used for the recycling of waste paper and the treatment of waste water. Also included is a modern chemical engineering laboratory, used for studies in all phases of unit operations and processes, process control, and analog simulation.

Undergraduate Program

The curriculum is entered at the junior level. Students with an associate degree in engineering science, science and mathematics, or chemical technology usually qualify for admission if their studies have included 8 credit hours of organic chemistry with laboratory. Other applicants with two years of college study may also gain admission if their curriculum includes the appropriate courses, as indicated below:

Lower Division Courses

Course Area	*Credit Hours*
Botany or Biology with Laboratory	4
General Chemistry with Laboratory	8
Organic Chemistry with Laboratory	8
Quantitative Analysis	3
Physics with Laboratory	8
Mathematics—Analytic Geometry and Calculus, Differential Equations Recommended	12
Computer Science	3
Economics	3
English	6
Engineering Drawing	1
Humanities or Social Science Electives	8
TOTAL MINIMUM LOWER DIVISION CREDITS	64

Minor deficiencies can usually be made up during the junior year.

The Paper Science and Engineering curriculum consists primarily of chemical engineering courses and specialized courses relating to the manufacture of pulp and paper products. A detailed listing of these courses is given below:

Upper Division Courses

Junior Year — *Credit Hours*

First Semester	FCH 572	Wood Chemistry II	3
	FCH 360	Physical Chemistry	3
	PSE 300	Introduction to Papermaking	3
	WPE 387	Wood Structure and Properties	3
	PSE 370	Principles of Mass and Energy Balance	3
	PSE 371	Fluid Mechanics	3
			18
Second Semester	PSE 372	Heat Transfer	2
	FCH 361	Physical Chemistry	3
	WPE 388	Wood and Fiber Identification Lab	1
	PSE 301	Pulp and Paper Processes	3
	PSE 302	Pulp and Paper Processes Lab	1
	ERE 377	Process Control	3
	*Elective		3
			16

SUMMER MILL EXPERIENCE: PSE 304 Mill Experience 2
(Twelve weeks of full-time pulp or paper mill employment approved by the Department between the junior and senior years.)

Senior Year — *Credit Hours*

First Semester	PSE 461	Pulping Technology	3
	PSE 465	Paper Properties	4
	PSE 473	Mass Transfer	3
	PSE 491	Paper Science and Engineering Project	1
	*Electives		6
			17
Second Semester	PSE 466	Paper Coating and Converting	2
	PSE 468	Papermaking Processes	3
	ERE 440	Water Pollution Engineering	3
	*Electives		6
			14

TOTAL MINIMUM UPPER DIVISION CREDITS 67

*At least 9 hours of electives must be selected from an advisor-approved sequence of technical courses. Examples of suggested areas are shown below.

TECHNICAL ELECTIVES

Colloid and Surface Chemistry
Instrumental Analysis
Polymer Chemistry
Pollution Abatement
Independent Research Project

Applied Mathematics
Computer Modelling
Principles of Management
Mechanics
Engineering Design
Materials Science

A total of 131 credit hours is required to complete the B.S. degree in paper science and engineering.

Graduate Program

Graduate studies reflect the strong trend toward diversification in the industry and offer opportunities for obtaining master of science and doctor of philosophy degrees in a variety of subjects related to the manufacture of pulp and paper. Individual study programs are designed to meet specific personal needs. Typical areas of study range from the development of new pulping processes, chemical interactions on the paper machine and the disposal of pulping and papermaking effluents, to the fluid dynamics of fiber suspensions, the colloid chemistry of papermaking constituents, and the physical properties of fiber networks.

An important component of the graduate program is thesis research under direction of a graduate advisor. Much of this research is carried out under the auspices of one of the outstanding research facilities in the world, the Empire State Paper Research Institute, (ESPRI), an integral part of the department. Its research activities aim to generate new information regarding the fundamentals, the science, the engineering and the technology of the papermaking process, utilizing advanced techniques such as electron microscopy, specialized spectrophotometry, nuclear magnetic and electron spin resonance and nuclear tracer methods. Recent work has been directed to fundamental investigations of pulping, bleaching, additives, paper recycling, effluent disposal, the papermaking process, the properties of paper, reactions of wood components during mechanical and chemical treatments, the structure of wood and wood fibers, evaporation, fluid dynamics, heat transfer, and chemical recovery.

Many research projects are carried out in cooperation with other College departments. Examples of such projects include a wide-ranging study of the toxicity of paper industry effluents in cooperation with the Department of Environmental and Forest Biology, and a cooperative project on the theoretical and experimental analysis of the mechanical properties of fiber and paper with the Department of Wood Products Engineering, as well as the Department of Aerospace and Mechanical Engineering at Syracuse University.

The department enjoys excellent external support in the form of graduate fellowships and grants from ESPRI and other industry sources, as well as a number of government granting agencies.

WOOD PRODUCTS ENGINEERING

GEORGE H. KYANKA, *Chairman* (Applied Mechanics, Structures) CÔTÉ (Cellular Ultrastructure, Light and Electron Microscopy), DAVIDSON (Physical Properties of Wood), DE ZEEUW (Wood Anatomy, Structure-Property Relations), R. HANNA (Ultrastructure and Microscopy), McKENNA (Structures, Construction Materials and Management), J. MEYER (Wood-Polymer Systems Radioisotope Techniques), R. MEYER (Wood Properties and Anatomy), MOORE (Bonded Materials Processing and Technology), SIAU (Protective Treatments, Transport Processes), SMITH (Polymeric Adhesives and Coatings).

While wood is one of the oldest structural materials known to man, it occupies a position of major economic importance today with the annual tonnage of wood produced in the United States far exceeding that of any other major structural material. This fact becomes even more important in this age of environmental and ecological concern because wood is the only major structural material that comes from a renewable natural resource, and demand is growing for more efficient utilization of available material. Improved efficiency must be based on solid scientific and engineering information. The Department of Wood Products Engineering provides undergraduate instruction in basic wood science and the application of science and engineering to the production, design, and utilization of wood-based materials. At the graduate level, the Department provides advanced courses and research opportunities in wood science and timber engineering.

Undergraduate Program

The Department of Wood Products Engineering prepares students for a wide variety of professional occupations concerned with the use of wood as a material. Two curriculum options are available: Building Construction and Forest Products. Both options have elective courses which permit tailoring the program to serve the needs of individual students from a wide variety of two year preparatory programs.

As the only major engineering material derived from a renewable natural resource, wood is receiving increased attention as an alternative to other materials which originate from the depleted nonrenewable resources. Thus, a principal aim of the departmental program is to teach students the fundamentals of efficient wood processing, product design, and final use, whether as a piece of furniture or as a complete building.

To enter either option at the junior level, a transferring student must have acceptable college credit in the following coursework areas. Individuals not meeting the basic outline shown are encouraged to contact the Admissions Office to work out special arrangements and/or additional study requirements:

Lower Division Courses

Course Area	*Credit Hours*
*General Chemistry with Laboratory	4
*General Physics with Laboratory	8
Mathematics—Analytical Geometry and Calculus	8-9
English	6
Recommended Courses	
Accounting	6
Biology or Botany	3-4
Computer Science	3
Economics (Micro- and Macroeconomics)	6
Engineering Drawing (Graphics)	2
Electives	16-18
TOTAL MINIMUM LOWER DIVISION CREDITS	62

*Students planning to enter the forest products option or building construction option need complete only 4 credits of physics, although 8 hours are recommended. However, students who wish to emphasize wood science in the forest products option must have: general chemistry with laboratory (8); general physics with laboratory (8); and general botany with laboratory (4).

The A.S. or A.A.S. degree in Civil, Construction, or Mechanical Technology may also fulfill the requirements for admission. Students who lack the above background courses are nevertheless encouraged to consult the Admissions Office and the faculty of the department for an evaluation of their academic records.

Building Construction Option

The current pressures for new building construction and urban reconstruction are served by this option which develops an awareness of the effects of construction on the environment, as well as the efficient use of materials, particularly wood. There is an increasing demand for technically trained specialists in the construction industry and supporting fields who have the skills to efficiently use today's wide variety of wood-based building materials, while understanding their place with respect to other engineering materials. The role of the engineer/manager is emphasized.

The specialty electives are designed to allow the opportunity for concentration areas related to the individual's career objectives. It is felt the wide range of construction and related engineering activities found in practice cannot be adequately serviced by a more rigid program of study.

Illustrative electives are listed below:

Engineering	*Management*	*Environment*
Structural Analysis	Marketing	Air Pollution Engineering
Building Systems	Business Law	Solid Waste Disposal
Adv. Soil Mechanics	Accounting	Waste Water Treatment
Thermodynamics	Finance	Environmental Sanitation
Energy Systems	Industrial Management	Land Use and Planning
Engineering Design	Operations Research	Solar Technology

Upper Division Courses

Junior Year — *Credit Hours*

First Semester	WPE 387	Wood Structure and Properties	3
	ERE 371	Surveying for Engineers	3
	ACC 204	Financial Accounting Systems	3
	Probability and Statistics Course		3
	MEE 221	Statics	3
			15
Second Semester	ERE 362	Mechanics of Materials	3
	ERE 364	Engineering Materials	3
	WPE 320	Polymeric Adhesives and Coatings	2
	WPE 321	Adhesives and Coatings Laboratory	1
	ACC 252	Introduction to Managerial Accounting	3
	Elective		3
			15

SUMMER FIELD EXPERIENCE: WPE390 Field Trip 2

Senior Year — *Credit Hours*

First Semester	WPE 422	Composite Materials	3
	FEG 410	Structures	4
	CIE 437	Soil Mechanics and Foundations	4
	ERE 496	Professional Development	1
	Management Elective Course		3
	Elective		3
			18
Second Semester	WPE 326	Fluid Treatments	2
	WPE 327	Fluid Treatments Laboratory	1
	WPE 450	Construction Equipment	3
	FEG 342	Hydraulics in Construction	4
	WPE 454	Construction Management	3
	Elective		3
			16
		TOTAL MINIMUM UPPER DIVISION CREDITS	66

A total of 128 credit hours is required to complete the B.S. degree in wood products engineering with the building construction option.

Forest Products Option

The forest products option is designed to prepare students for employment in the wood products industry. This may be oriented either toward production in manufacturing plants or toward the distribution and marketing segments of the industry. Through careful selection of courses, students can develop an emphasis in marketing, production systems engineering, or wood science and technology.

Students wishing to pursue a career in research related to wood and wood products are accommodated by selection of science courses to fulfill emphasis requirements. An M.S. degree is recommended for those wishing to enter the research field.

With careful planning and selection of electives, students may fulfill the entrance requirements of many universities for a Master in Business Administration program and may be able to obtain this degree without additional background courses.

Upper Division Courses

Junior Year — *Credit Hours*

First Semester	WPE 322	Mechanical Processing	3
	WPE 387	Wood Structure and Properties	3
	WPE 388	Wood and Fiber Identification Laboratory	2
	*Computer Programming Course		3
	*Emphasis Course		3
	*Electives		3
			17
Second Semester	WPE 320	Polymer Adhesives and Coatings	2
	WPE 321	Adhesives and Coatings Laboratory	1
	WPE 326	Fluid Treatments	2
	WPE 327	Fluid Treatments Laboratory	1
	WPE 343	Structural Materials and Elements	3
	*Emphasis Course		3
	*Electives		3
			15

SUMMER FIELD EXPERIENCE: WPE 390 Field Trip 2

Senior Year — *Credit Hours*

First Semester	WPE 422	Composite Materials	3
	Probability and Statistics Course		3
	WPE 497	Seminar	2
	*Emphasis Courses		6
	*Electives		3
			17
Second Semester	WPE 404	Design of Wood Structural Elements	3
	*Emphasis Courses		9
	*Electives		3
			15

TOTAL MINIMUM UPPER DIVISION CREDITS 66

*Specific courses selected for these requirements must have the advisor's approval.

A total of 128 credit hours is required to complete the B.S. degree in wood products engineering with the forest products option.

Emphasis Courses

A student desiring to emphasize MARKETING should select 24 credit hours from the following listing of courses:

ERM 206	Microeconomics	3	ERM 205	Macroeconomics	3
WPE 442	Light Construction	3	ERM 404	Economics of Wood-Using Industries	3
LPP 355	Intro. Legal System	3	ERE 364	Engineering Materials	3
MAR 355	Marketing and Society	3	ACC 252	Intro. to Managerial Accounting	3
FIN 355	Money and Banking	3	OPM 365	Management of Operations I	3
ACC 204	Financial Accounting	3	OPM 366	Management of Operations II	3

A student desiring to emphasize PRODUCTION SYSTEMS ENGI—NEERING should select 24 credit hours from the following listing of courses:

ECE 221	Electrical Science I	3	MEE 351	Fundamentals of Thermodynamics	3
IOR 548	Engrg. Econ. Anal.	3	ECE 222	Electrical Science II	3
IOR 575	Ind. Meth. and Syst. Engr.	3	ERM 461	Oper. Cost. Cont.	3
WPE 498	Design Problem	3	IOR 326	Stat. Methods for Eng. II	3
IOR 325	Statis. Methods for Eng. I	3	IOR 527	Human Factors in Eng.	3
IOR 521	Motion and Time Study	3	IOR 536	Material Handling	3
IOR 534	Stat. Quality Control	3			

A student desiring to emphasize WOOD SCIENCE should select 24 credit hours from the following listing of courses:

FBO 315	Dendrology	3	CHE 356	Physical Chemistry	3
CHE 346	Physical Chemistry	3	FCH 520	Nucl. and Rad. Chem.	2
PHY 361	Intro. Modern Phys.	3	FCH 521	Nucl. Chem. Tech.	1
MEE 221	Statics	3	MEE 222	Dynamics	3
WPE 498	Design Problem	3	WPE 688	Tropical Timbers	2
FBO 562	Wood Microbiology	3	WPE 689	Tropical Wood Anatomy	1
FBO 585	Plant Anatomy	3	FBL 330	General Physiology	3

Graduate Program

Recent research projects in wood ultrastructure have dealt with the interaction of coatings and adhesives with the wood substrate, with cell wall development, with the effectiveness of wood preservatives, and with the identification of natural inclusions in wood. Projects in tropical wood identification and structure-property relations in foreign timbers are examples of work in the field of systematic wood anatomy. The field of wood physics has had active projects in the permeability of wood and the mechanics of fluid transport. Current projects in the field of mechanics are focused on the elastic behavior of wood and wood base composites, fracture mechanics of wood, the behavior of new structural designs, such as truss systems, and the mechanical properties of laminated-veneer-lumber. In addition, there is growing interest in studying the physical properties of wood-based composite materials and the chemical modification of wood, as well as wood finishing systems.

Laboratory facilities include a modern mechanical testing laboratory which has a wide range of testing machines, a physics laboratory with electronic instrumentation, and complete wood processing facilities including a sawmill, plywood mill, dry kilns, and wood preservation equipment. One of the United States' largest foreign wood collections is used for graduate research and to support the program of the Tropical Timber Information Center (TTIC).

In addition, the College has available a complete microscopy laboratory, containing both scanning and transmission electron microscopes, a wide variety of light microscopes, and related equipment. Extensive equipment for chemical analysis and nuclear chemical techniques also serve the research program.

THE SCHOOL OF FORESTRY

JOHN V. BERGLUND, *Dean* (Silvics, Silviculture)

ABRAHAMSON (Entomology, Pathology, Pesticides), ARMSTRONG (Industrial Economics, International Forestry), BENNETT (Economic Theory, Economic Thought in Forestry), BLACK (Watershed Management), BURRY (Forestry Extension, Primary Processing), CANHAM (Economics of Non-Market Forest Resources), CRAUL (Forest Soil Science), CUNIA (Operations Research, Statistics, Mensuration), DALL (Environmental Policy and Law), ESCHNER (Forest Influences), FISHER (Forestry Extension, Woodlot Management), GRATZER (Forest Recreation, Forest Management), GRAVES Forest Resource Policy, Planning, and Management), HERRINGTON (Meteorology, Urban Forestry), HORN (Forest Business Management, Law), HOWARD (Silvics, Forest Management), KAUFMAN (Tropical Silviculture), KOTEN (Forest Management, Systems Analysis), LARSON (Forest Resource Policy and Administration, International Forestry), LEA (Silviculture, Timber Harvesting), MARLER (Resource Policy and Administration), MAYNARD (Tree Improvement), MONTEITH (Forestry Economics, Land Use), MORRISON (Forestry Extension, Outdoor Recreation), NYLAND (Silviculture), PETRICEKS (International Forestry Economics, Macroeconomics), RICHARDS (Silviculture, Urban Forestry), SAGE (Huntington Forest), STITELER (Biometry, Experimental Design, Computer Applications), TIERSON (Adirondack Ecological Center), WHITE (Forest Soil Science), YAVORSKY (International Forestry).

Adjunct Faculty

HEISLER (Meteorology), HORSELEY (Silvics), MARQUIS (Silviculture).

Undergraduate Program

The School of Forestry prepares students for the critical role of managing forests and related resources and their associated environments for human benefit. Management in this sense embraces the integration of basic ecological and social principles into comprehensive programs of planning, manipulation, and use of forest and open lands for the sustained production of timber, forage, water, wildlife, and recreational values consistent with national needs and the protection and enhancement of environmental quality. It includes, further, the effective implementation of these programs via the administrative process, in accordance with established policies and goals and in cooperation with individuals and organizations, both public and private.

Students completing the School's undergraduate program are qualified for professional practice as foresters and environmental managers with public and private organizations or as private consultants serving a wide array of clients. The potential for a meaningful career in service to human welfare becomes significant when one recognizes the vast amount of land area covered by forests. Nearly 60 percent of New York State is classified as forest land, while roughly one-third of the land area of both the United States and the world is so classified. The goods and services that flow from this vast resource base are of critical and growing importance to the needs of modern society and influence: in a major way, the quality of the environment.

The program also offers opportunity for students to pursue special interests, to prepare for advanced study, or to develop their capabilities for service in a variety of fields pertinent to renewable natural resources and the environment, but not specifically forestry oriented.

The Forestry Management Curriculum

Though it represents the oldest area of professional instruction in the College, the current curriculum was implemented with the entering class in 1973. A core of required upper division courses, totaling 42 semester hours, presents the basic principles and practices that underlie the purposeful management of forest and related resources for optimum production and use of any one, or more, of their potential products and services.

Extensive elective opportunities, totaling over one-fourth of the program, are available to help broaden the student's general education, to strengthen perceptions and integration of knowledge, to enable the student to enhance depth of understanding in areas of environmental and forest resource management of special interest, or as a base for subsequent study at the graduate level. Areas of concentration provide meaningful sequences in terms of subject matter coverage. Such areas currently include forest resource science, management science, urban forestry, international forestry, and applied forest resource management within any of which emphasis may be focused on multiple-use forest management, or on single-use values such as timber, forage, watershed, wildlife, recreation, and aesthetics.

Additional areas of concentration may be developed in cooperation with other disciplinary units of the College. Moreover, students need not select a given area of concentration, but may choose elective courses in accordance with their respective interests and needs, the only restriction being that such selections have the approval of the student's faculty advisor.

A significant feature of the elective component of the curriculum in forest resource management is that the spring semester of the senior year consists wholly of electives and thus is available for a variety of independent or group study activities. These may be conducted in whole or in part on any one of the College's several campuses, off campus at another institution, in cooperation with some resource management agency or firm, or in conjunction with an overseas academic program operated by the College. Proposals for off-campus study are subject to faculty review and are carried out with varying degrees of faculty guidance to ensure adherence to academic standards.

Considerable emphasis in the curriculum is placed on field instruction to provide students with intimate knowledge of how the forest ecosystem functions and how it is manipulated and used for a variety of owner objectives. Attendance at a five-week, six-credit hour Summer Session in Field Forestry is required prior to registration for the junior year. This session serves as the major avenue of entrance into the curriculum.

Close to half of the required upper division core courses are conducted wholly or primarily in the forest environment and entail substantial physical activity such as conducting field surveys, inventorying timber and other resources, thinning forest stands, and planting trees. As part of the conditions for admission to this program, applicants must be willing and able to function effectively in the field under a wide range of terrain and weather conditions. Any questions or concerns about this requirement should be directed to the Director of Admissions.

The curriculum is designed to facilitate the transfer of qualified students from liberal arts and science programs in community colleges and other institutions of higher learning. For students contemplating such transfer, it is required they have completed at least 64 semester credit hours or an associate degree, and further, that they have a minimum of 48 of these credits distributed among specific course areas as outlined below. The maximum number of freshman-sophomore semester credit hours which may be transferred is 64. Up to 12 additional hours of junior-senior level courses may be transferred. The professional forester must understand both the biological and social influences that impinge upon the use of forest resources. Prospective transfer students should choose elective courses that will serve to broaden and enhance their understanding in the social and political sciences, humanities, and communication skills.

Lower Division Courses

Course Area	*Credit Hours*
Biology (Botany and Zoology) with Laboratory	8
General Chemistry with Laboratory	8
General Physics with Laboratory	8
Mathematics, through Integral Calculus	6
*Economics (Macro- and Microeconomics)	6
*Introductory Sociology or Psychology	6
*Political Science (U.S. Institutions)	6
English	6
*Electives	10
TOTAL MINIMUM LOWER DIVISION CREDITS	64

*Students may be admitted with 3 credit hours in each of the following: economics, psychology/sociology, and political science. These deficiencies must be removed as early as possible in the student's program, including the use of summer sessions.

Upper Division Courses

Summer:	[1]ERM 300	Summer Program in Field Forestry	6
Junior Year			*Credit Hours*
First Semester	FOR 331	Introduction to the Physical Environment	6
	FOR 332	Silvics-Silviculture	8
	FOR 322	Forest Mensuration	3
			17
Second Semester	FOR 360	Principles of Management	3
	FOR 370	Management of the Forest Enterprise	3
	Computer	Science Course	1
	APM 391	Introduction to Probability and Statistics	3
	[2]Electives		6
			16
Senior Year			
First Semester	APM 492	Forest Biometrics	3
	FOR 400	The Social Environment of Resource Management	3
	FOR 461	Management Models	3
	[2]Electives		6
			15
Second Semester	[2]Electives		17
			17
		TOTAL MINIMUM UPPER DIVISION CREDITS	71

[1]SUMMER PROGRAM IN FIELD FORESTRY—five weeks, 6 credit hours: Required of all students *prior* to registration for the junior year.

[2]One half of the student's elective hours during the junior and senior years must be in courses taken in no fewer than three of the following Schools: Forestry, Environmental and Resource Engineering; Biology, Chemistry, and Ecology; Landscape Architecture. The remaining elective hours should be used to round out the professional education of a student.

A total of 135 credit hours is required to complete the B.S. degree in resource management.

Graduate Program

Graduate education in the School of Forestry builds upon the basic foundation of professional knowledge acquired by students in its undergraduate curriculum or in similar or closely allied programs of study. Instruction at this level is designed to prepare students for careers in resource administration, professional education and research, and a variety of other specialized positions in public and private employment bearing directly or indirectly on forest resources management.

The School offers advanced study opportunities under two broad degree programs: Forest Resource Management and Policy, and Silviculture and Forest Influences. In addition, its faculty contribute significantly to several College-wide graduate programs and joint areas of advanced study, including fish and wildlife, managerial science, water resources, environmental planning, environmental science, and soils science.

Several areas of specialization are available within the two degree programs. Opportunity is also provided for students, in consultation with faculty advisors, to arrange areas of study specific to their interests and needs which integrate elements of two or more areas of specialization, as in urban forestry and international forestry. Whatever the program, the basic purpose is to help the student acquire the tools and facility for disciplined, logical, critical, constructive, and creative thinking, and for clear expression in the selected field.

Prospective students who desire more information than is presented for each of the graduate programs and specialties described below should contact the Dean, School of Forestry.

RESOURCE MANAGEMENT AND POLICY (RMP)

The objective of the RMP program is to prepare graduates at the Master's or Ph.D. level with a sufficient depth and breadth of understanding so that they will be able to function in and ultimately make significant contributions to the field of resource management and policy. This field is extremely diverse and includes employment opportunities with private firms that own, manage, and/or use natural resources, a myriad of public agencies from the federal to the local level, teaching opportunities in forestry or natural resource programs, or research work as conducted by a number of public and private agencies. Furthermore, students may choose to concentrate study in a particular specialty area of the field, or to prepare themselves more broadly for traditional managerial duties.

Each of these possibilities demands different interests and talents on the part of the student and different types of preparation in the course of graduate study. For these reasons our entering students are expected to have made a searching self-analysis of their abilities, potentials, and ambitions so they can enter the program with well defined career goals and utilize the graduate experience to its best advantage. The RMP program differs from the more science oriented offerings of the College in that while technical competence is expected, students are additionally required to relate this competence to the social and political environment in which they will be functioning. The student's interest must be broad enough to encompass these social areas, or be prepared to devote some study to these subjects while in residence.

The expertise of the RMP faculty is in the area of management, policy and economics as it relates to forest and associated natural resources. It is expected that students entering the program will share similar interests and concentrate their studies in this broadly defined field. However, the resources of Syracuse University's School of Management and Maxwell School of Public Administration are available to our students, and graduate level courses in the more general area of management and policy may be taken in these schools when appropriate to the student's overall graduate program.

As previously described, the RMP program is individualized to meet the scholastic and career goals of the student within the capabilities of the faculty. Faculty strength and student interest over the years have been highest in the following concentrations, and they are described as illustrative of the type of graduate study available to entering students.

FOREST MANAGEMENT

Forest management focuses on the planning and implementation processes necessary to achieve integrated use of forests and associated natural resources. The educational objective is to develop expertise sufficient for capable, professional resource management under a variety of natural and societal environments.

The study of forest management requires a broad knowledge of both the natural and social environments as the basis for an understanding of the way in which these environments affect or are affected by the development and utilization of forests and associated wildlands. Implementation of plans also requires an understanding of the social environment as well as the managerial process to facilitate working with people both inside and outside of the organization.

Programs are flexible and a student may pursue a special interest in a single product, several products or services, tools and processes of planning for integrated forest use, or in developing managerial skills. The emphasis of the program, however, would be in the application of the skills and knowledge to the management of forest lands. Where appropriate, courses may be taken at Syracuse University's School of Management and the Maxwell School of Public Administration to complement course offerings in the School of Forestry and other Schools of the College. Recent graduates have found employment in all of the diverse areas described above.

POLICY AND ADMINISTRATION

Graduate study in the area of resources policy and administration is designed to prepare students for leadership positions in the broad range of responsibilities at the planning, budgeting, programming, and operating levels of public agencies and businesses. The expanded role of federal and state government oversight over resource use and land management has brought substantially increased need for thorough understanding of policy matters, legal requirements, and governmental and political interactions with resource owners and users. Advanced courses, seminars and special problems structured around these needs and the complex interrelationships of society with resources are offered. A wide array of complex problems of administrative management, resources policy issues, and related legal, financial, and executive needs are included among the topics that may be emphasized.

Students are encouraged to round out their academic programs through the courses offered by other units of the College as well as Syracuse University Graduate School of Citizenship and Public Affairs and the School of Management or other graduate units. Students with undergraduate preparation in forestry, liberal arts, engineering, or other appropriate areas who have strong interest in resource administration and policy can be served through selection of necessary emphases that complement work already taken.

The broad array of possibilities of course selection and the diverse points of view that are available allow the student to build a program to meet specific career objectives. The breadth and diversity also offers the student an opportunity to develop talents for managerial leadership and policy positions in various aspects of enterprises and public agencies whose work is critical to the future of resources management.

FORESTRY ECONOMICS

The program is designed to meet the needs of the student with an undergraduate degree in forestry or forest products. With some additional courses in forestry, the program also serves the graduate in liberal arts, engineering, or business, should interest point toward the economics of forest management. The goals are depth of understanding and familiarity with economic tools contributing to making competent decisions in resource economics, management, and policy.

The core of the program consists of courses in forestry and resource economics as offered by School faculty. In addition, one must be aware of the social and biological environment in which forestry economics is applied. To this end the program is supplemented by courses in general economics, statistics and operations research, resource policy, business administration, and related managerial and biological fields. The course offerings and facilities of the School, the rest of the College, and Syracuse University are actively drawn upon.

Individual programs are tailored to fit the student's particular interest: for example, the economics of timber management, land use economics, economics of natural environments, economic development and forestry. Graduates with the Master's degree find employment typically as forest economists or resource analysts with federal and state agencies, and with private industry. Graduates with the Ph.D. usually find careers in teaching or research.

RECREATION MANAGEMENT

Graduate study in this area equips students with a broad understanding of the nature and purposes of outdoor recreation and how they relate to natural resources, and builds the skills necessary for capable recreation management.

Individual programs combine study in resources management with relevant studies in the social and political sciences and development of analytical capabilities needed to implement plans and programs. Other schools of the College and of Syracuse University, treating such areas as planning, engineering, design, and education, provide a wide range of supporting courses and facilities.

All program areas in RMP require that each student take a minimum of 12 credits of coursework within the School of Forestry. Courses in Applied Mathematics (APM) can also be used to meet this requirement. If a student's prior preparation is inadequate to meet the graduate program objectives, the major professor and/or committee will suggest appropriate remedial coursework to make up the deficiency.

Master's Degree Program

All three Masters' options are available to students in the RMP program. Although differing in format, the options have the common purpose of bringing each student to a similar level of understanding and ability in his chosen field. Because each option emphasizes a different element of the total program goals, the choice of an option should be based primarily upon a student's career objectives.

In the case of option 2, Academic or Professional Experience, the RMP faculty has chosen to increase the coursework requirement to 30 credit hours. At the present time the use of this option is limited to situations where appropriate experience can be negotiated between a student and an outside institution.

Ph.D. Degree Program

Requirements for the doctorate usually build upon a master's degree, and demand a substantial mastery of material related to the dissertation topic. At the same time, a number of other fields are chosen to support or integrate the selected central topic of doctoral study. There is no minimum credit requirement, but the normal course workload is 30 credits and a minimum of 12 credits of coursework must be taken within the School of Forestry. The field work for and the writing of a dissertation usually requires a minimum of 12 months.

The additional requirements for a doctoral program, beyond a master's degree are the passing of written and oral candidacy examinations which are intended to test the student's integration of subject matter, and the writing and successful defense of a dissertation. A preliminary examination may be required to make an early appraisal of the student's intellectual qualifications to determine levels of understanding of the scientific and technical disciplines he is studying, and to guide the development of an adequate program of study.

SILVICULTURE AND FOREST INFLUENCES

Concern for the forest ecosystem provides a major focus for graduate study in the Silviculture and Forest Influences Program. This ecosystem is viewed as a producer of goods and services and as a modifier of the physical environment in which man lives. It is in this context that translation of these concerns to broader questions of environmental quality is emphasized.

Silviculture in its functional sense is the bridge between fundamental biological and physical relationships and the applications of these relationships in the forest environment. Thus, graduate study in the many aspects of silviculture can cover a broad spectrum of disciplines, and can be as basic or as applied as the objectives of the student indicate. Individual study programs are coordinated with various areas of specialization both within the School of Forestry and with other departments of the College, of the State University of New York, and with Syracuse University. A major strength is the close association of faculty scientists, representing a wide range of specialties, and the formal and informal cooperative arrangements they have developed with their counterparts in federal and state agencies, and in industry.

Physical facilities that are routinely used in graduate study within the Silviculture Program include well-equipped laboratories, specialized equipment, greenhouse facilities, and extensive College forests.On these 25,000 acres of forestlands are located natural and planted stands, seed orchards, a forest tree nursery, and two large micro-climate tower complexes with associated automated data acquisition systems and instrumentation. Major field installations include long-term northern hardwood stand improvement studies and the oldest continuous forest fertilization study in the United States. Cooperative arrangements also exist for work on corporate lands, private properties, and governmental ownerships.

Qualifications for Admission

In addition to the general College-wide requirements for admission to graduate study, applicants to the graduate program in Silviculture and Forest Influences should have prior education or experience in resource management and have a deep personal commitment to forest resource management as a career goal. Students with preparatory deficiencies may be permitted to take corrective coursework.

Minimum Requirements

MASTER OF SCIENCE

Candidates for the master of science degree are required to complete 30 semester hours of graduate work beyond the baccalaureate degree. From 6 to 12 semester hours of this total can be credited for writing and defending a thesis.

This graduate degree is intended for students seeking an intermediate level of education in a scientific, professional, or technological field. It provides an introduction to research and related scholarly or professional activities and requires the student to demonstrate competence in a selected field of study. Consideration may be given to the development of a study program that provides a foundation for continuation to the Ph.D. degree, or provides an advanced professional education in forestry and serves as preparation for a career requiring special technical ability, or familiarity with research techniques.

All Masters' candidates are required to prepare a thesis to satisfy requirements for the completion of the Silviculture and Forest Influences program. The topic addressed by the student should be research oriented, and expand or clarify knowledge in a particular field with some opportunity for generalizing the results. Students are required to define an appropriate problem for investigation; review relevant information sources; develop a study design; collect, organize, analyze and interpret data; and draw conclusions.

DOCTOR OF PHILOSOPHY

The Ph.D. program usually builds upon a master's degree and demands mastery of material in a specialized field as well as the integration of a number of supporting fields. It requires scholarship of a high order, and successful fulfillment of independent research that makes an original contribution to forestry science.

The degree provides for advanced scientific study and development of the capability to independently organize and conduct research. Graduates fill a variety of positions in research, research administration, teaching and consulting in public agencies, private corporations, universities and foundations.

Students must develop strong scientific capabilities and demonstrate a capacity to solve complex problems in research. They must demonstrate a capability for independent work, but must interact effectively with faculty and other scientists in their chosen field of specialization.

There is no minimum credit requirement, but the normal course workload is 30 graduate credits beyond the master's degree. In addition, the fieldwork for and the writing of the dissertation usually requires a minimum of 12 months.

Candidates for the Ph.D. degree must pass a written and oral candidacy examination, and write and defend a dissertation.

Doctoral candidates are required to demonstrate competency in one foreign language and statistics.

Fields of Specialization

Included within the Silviculture and Forest Influences Program are five fields of specialization that, singly or in combination, provide the graduate student with a wide array of coursework, research activities, and faculty guidance all aimed at enhancing understanding of the forest ecosystem. These specializations are silvics, silviculture, forest soil science, tree improvement, and forest influences. Students in the program can direct their studies toward careers in professional practice, research, or education. Similarly, study in these specialty areas can emphasize any of a number of areas of professional application, such as public or private forest management, urban forestry, or international forestry, depending on the individual's interest.

SILVICS

Silvics has been defined as that branch of forestry which provides the scientific base for the cultural treatment of forest vegetation by (1) studying and defining interrelationships within forest ecosystems and (2) cataloging general intraspecific characteristics of tree species. In a sense, silvics is the ecology of managed forest ecosystems, although unmanaged and natural forests are often studied intensively to provide the benchmark conditions from which the silviculturist begins.

The specialist in silvics must maintain channels of communication with colleagues in the basic disciplines, including those in soil physics, soil chemistry, micro-meteorology and climatology, genetics and tree breeding, plant ecology and physiology, wildlife biology, entomology, and pathology. In addition, certain tools, including a comprehensive knowledge of probability and statistics, the ability to use modern computers effectively, and a familiarity with measurement and sampling theory, are required by specialists in most applied sciences including silvics.

The specialist in silvics is essentially at one focal point of much of what has been called fundamental forest research. His most useful function and worthwhile contribution to the field of forestry may very well depend on the ability to synthesize relevant material and, through experimentation, provide the silviculturist with information and possible techniques for use in the cultural treatment of forest vegetation.

SILVICULTURE

Classical silviculture can be defined as the theory and practice of the manipulation of forest ecosystems, including the control of vegetation establishment, composition, growth, and quality. The nature of cultural treatments, the theories upon which they are based, and the biological, physical, and social constraints to their implementation are stressed in this area of specialization. Elements of forest vegetation are intensively examined from the dual standpoints of fulfilling management goals for goods and services and maintaining or enhancing biotic productivity for the future.

Management goals are considered to include all the many and varied goods and services that the basic forest resource is capable of supplying. Forest productivity is of basic concern; the student specializing in this area progresses through formal coursework and research toward an understanding of the effect of various treatments on the continuous, balanced, and adequate supplies of wood, water, wildlife, recreation opportunities, and amenity values. One major area of emphasis within this specialization relates to treatment of tree stands for their continued production of wood products and other commodities. Another emphasis centers on the treatment of stands that are managed for several values simultaneously, where the harmonious integration of uses is of concern. A third emphasis focuses on evalution and manipulation of vegetation systems primarily for their on-site values, such as in wilderness and recreation areas, highway and utility rights-of-way, mining and other wasteland reclamation, and urban greenspace. This involves a broad interpretation of forest ecosystems that includes herbaceous and shrub systems as well as silvics.

The Silviculture graduate specialization is aimed at preparing foresters to understand and evaluate forest ecosystems in whatever depth may be required, and to prescribe treatments or further experimentation to attain management objectives or increase knowledge toward this end.

FOREST SOIL SCIENCE

Graduate studies in this area of specialization may be directed toward aspects of soil science related to the quantity and/or quality of goods and services in the management of resources of nonagricultural lands, and the impact of managment practices on environmental quality. These include soil moisture, soil temperature, and nutrient element status interrelationships in the evaluation of soil productivity; evaluation of ecosystems to quantify nutrient element balances and cycling; amelioration of soils for increased productivity; and impact of various land-use practices on soil productivity.

Modern well-equipped laboratories are available for graduate student use in plant, soil, and water chemical analyses; soil water-holding capacity and compaction; infiltration and runoff; and other chemical and physical property investigations. The extensive College properties noted previously permit forest soil research to be conducted under a wide variety of environments and ecological conditions.

Programs are coordinated with other areas of specialization through cooperation among school personnel, with other departments of the College, Syracuse University, and the U.S. Forest Service.

TREE IMPROVEMENT

Tree improvement has become an important component of intensive forestry practice. Its main objective is to breed for commercial distribution varieties of trees that are well adapted to such specified conditions as management objectives, cultural practices, and physical and biological site factors. As a specialized study area, it draws upon such fields as genetics, plant biochemistry and physiology, and statistics.

FOREST INFLUENCES

Forest influences as an area of graduate study includes all the effects resulting from the presence of forest trees and associated vegetation on climate, the hydrologic cycle, erosion, floods, and soil productivity. Health considerations and human comfort have often been included in older definitions of forest influences, and are assuming greater importance today with our growing concern for the environment.

Included among the principal studies in this area are energy exchange between forest and atmospheres; moderation of urban environments by vegetation; soil and slope stability; and watershed hydrology, including snow.

Graduates fill a variety of positions in research, teaching, and public and private management as watershed management specialists, hydrologists, environmental officers, meteorologists, and ecologists.

SCHOOL-WIDE AREAS OF STUDY

INTERNATIONAL FORESTRY

Graduate education in international forestry as an area of emphasis is available to students under both the Forest Resource Management and Policy, and Silviculture and Forest Influences programs and is designed to assist individuals who are intent upon pursuing internationally-oriented careers in forestry and related fields.

Instruction is aimed at supplementing and enriching the student's technical forestry knowledge and providing the broad background deemed necessary for effective service in a variety of professional areas. These include forestry advisor, teacher, or research specialist with national and international agencies, private business and industrial firms, philanthropic foundations, and voluntary service organizations whose activities include the development and use of forest resources in other lands.

At the master's level, program emphasis is on the attainment of general competence in research methods, foreign languages, cultural anthropology, world geography, and international affairs, plus a broad understanding of the world forestry situation. At the doctoral level, program concentration is on a specialized discipline area such as forestry economics, forest policy and administration, forest management, or silviculture. Orientation to the world forestry field is achieved in part through the selection of formal coursework, and in part through providing an opportunity for the student to conduct his thesis research in residence abroad.

A wide variety of course offerings are available to support the nonforestry elements of this area of study through Syracuse University. Opportunity for field training and research in tropical forestry and related fields is available to qualified candidates, especially at the doctoral level, under cooperative agreements maintained by the College with the Institute of Tropical Forestry in Puerto Rico and the University of the Andes, Merida, Venezuela.

URBAN FORESTRY

Graduate study in urban forestry allows the student to pursue either of two broad objectives. Professional Urban Forestry skills may be broadened in the many areas of information important to the practice of forestry in urban and urbanizing areas through advanced coursework and applied research. More specialized study may be pursued in scientific disciplines supporting the practice of urban forestry. Active areas of specialized research and study in the School includes soils, greenspace ecology, atmospheric science, tree improvement, forest resource inventory and evaluation, and resource economics and planning. There is strong interaction with other urban-related areas of study within the College, including remote sensing, botany, pathology, entomology, and wildlife ecology. Academic departments in the Maxwell School of Public Affairs at Syracuse University such as Geography, Economics, Political Science and Sociology, cooperate with teaching and research programs in urban forestry. The U.S. Forest Service, Northeastern Forest Experiment Station, maintains a permanent staff of scientists in their Urban Forest Research Project on campus who are engaged in studies dealing with the planning and management of urban forest ecosystems. This work complements the College's participation as one of nine universities in the Consortium for Environmental Forestry Studies, an organization of scientists and graduate students studying a wide range of problems in urban forestry.

QUANTITATIVE METHODS

Study in the area of quantitative methods is designed to develop professionals skilled in mathematical and statistical problem solution and equipped to act as biomatricians or mensurationists.

The program is designed primarily for students who have done their undergraduate work in areas such as biological sciences, forestry, wildlife, or agriculture. Others who lack background courses may take this material concurrently. Students may concentrate in statistics, operations research, biometry, or forest mensuration. Syracuse University's computer facility and a wide range of courses in mathematics, statistics, and quantitative methods give strong support to the program.

THE SCHOOL OF LANDSCAPE ARCHITECTURE

ROBERT G. REIMANN, *Dean*

FACULTY

GEORGE W. CURRY. *Professional Experience*: The Reimann-Buechner Partnership, Landscape Architects, Syracuse; The Curry-Paulo Partnership; Member, Syracuse Conservation Advisory Council, Syracuse Urban Cultural Parks Advisory Committee, and Chairman, Syracuse Landmark Preservation Board. Licensed Landscape Architect, New York State. *Fields of Specialization*: Site Planning, Urban Analysis and Design, Historic Preservation.

GEORGE F. EARLE. *Professional Experience*: School of Architecture, Syracuse University; Artist; President, World Affairs Council. *Fields of Specialization*: History of Art, Cultural History; Painting, Latin American Art; History of Landscape Architecture; Design; Pre-Colombian Art.

JOHN P. FELLEMAN. *Professional Experience*: Planning Engineer, Monroe County, N.Y.; Urban Planner, NYS Hudson River Valley Commission; Chief Planner, Bruce Howlett, Inc.; Licensed Professional Engineer, New York State; Designated Planner-in-Charge, New York State. *Fields of Specialization*: Site Systems Engineering; Route Location; Public Works Administration; Resource Data Banks.

CLAUDE C. FREEMAN. *Professional Experience*: Russell Bailey and Associates, Landscape Architects and Planners; Alfred Obrist, Landscape Architect and Civil Engineer. *Fields of Specialization*: Site Design, Plant Materials, Graphics.

DAVID L. HANSELMAN. *Professional Experience*: Ohio Department of Education, Ohio Department of Natural Resources, Ohio State University. *Fields of Specialization*: Communications Strategies and Message Design, Non-Print Communications.

DAVID B. HARPER. *Professional Experience*: Teaching intern, Boston Museum of Science; American Friends Service Committee, Mexico and Algeria; Teacher/Director, Franconia College, New Hampshire; Regional Archaeological Survey in Greece, University of Pennsylvania; Natural Resources Planner, Central New York Regional Planning and Development Board, Syracuse. *Fields of Specialization*: Regional Environmental Planning; Visual Quality Assessment; Archaeological Environmental Analysis.

RICHARD S. HAWKS. *Professional Experience*: EDAW, Inc., Cambridge Research Institute. *Fields of Specialization*: Regional Planning and Design, Facility Siting and Routing, Geographic Digital Data Banks.

ALLEN R. LEWIS. *Professional Experience*: Bucks County Planning Commission, Pennsylvania. *Fields of Specialization*: City and Regional Planning; Gaming and Simulation; System Dynamics.

FRANK L. MARAVIGLIA. *Professional Experience*: High school graphics and industrial arts; permanent certificates as Secondary Principal, Supervisor of Industrial Arts; Teacher of Industrial Arts, New York State; (Instructor) Creative Problem Solving, Syracuse University, and SUNY Buffalo. *Fields of Specialization*: Technical Graphics; Creative Problem Solving; Communication.

VINEETA MEHRA. *Professional Experience*: North Carolina State University; School of Planning and Architecture, New Delhi, India. *Fields of Specialization*: Landscape Design, Landscape Materials and Construction, Plant Materials, Landscape Engineering, Residential Landscaping.

RICHARD T. MURPHY. *Professional Experience*: Research Analyst, Minnesota Center for Urban and Regional Affairs; Landscape Architect, W. Butler Engineering Company; Partner, Murphy-Lindberg, Landscape Architects. *Fields of Specialization*: Environmental Land Use Planning, Regional Resource Analysis Methods, Energy and Land Use Planning Design.

JAMES F. PALMER. *Professional Experience*: Research Associate, The Environmental Institute, University of Massachusetts; Associate Social Scientist and Resource Planner, Carlozzi, Sinton & Vilkilis, Inc.; College Planner, Kresge College, University of California at Santa Cruz. *Fields of Specialization*: Landscape Perception, Design Evaluation, Social Impact Assessment, Environment and Behavior Research Methods.

THOMAS A. PAULO. *Professional Experience*: Cowin & Kilcommins, Attorneys at Law. Licensed Attorney State of New York; The Reimann-Buechner Partnership, Landscape Architects, The Curry-Paulo Partnership. *Fields of Specialization*: Law; Basic Design; Site Analysis and Design.

ROBERT G. REIMANN. *Professional Experience*: Landscape Architect, Pedersen, Hueber, Hares and Glavin; Sargent, Webster, Crenshaw & Folley, Architects, Engineers, and Planners; City of Montreal, Landscape Architect, Parks and Playgrounds; The Reimann-Buechner Partnership; Landscape Architects, independent practice. Licensed Landscape Architect, State of New York. *Fields of Specialization*: Methods and Philosophy of Design.

RICHARD C. SMARDON. *Professional Experience*: Wallace, Floyd, Ellenzweig, Inc., Cambridge, Mass.; Executive Office of Environmental Affairs, Commonwealth of Massachusetts; Oregon State University Extension Service; Institute for Urban and Regional Development, University of California; USDA Forest Service. *Fields of Specialization*: Landscape Architecture and Regional Planning, Water Resource Aesthetics, Environmental Assessment/Administration, Wildlife Aesthetics.

RICHARD A. SULZINGER. *Professional Experience*: Landscape Architect; Architect, Registration in State of Oregon, Private Practice, Richard Sulzinger and Associates, Eugene, Oregon; Design Behavior Research Fellow, Housing Research and Development, University of Illinois. *Fields of Specialization*: Visual Communications; Site Analysis; Design; Design Behavior Research and Statistical Analysis; User Participatory Process in Urban and Regional Design.

DANIEL A. SUNDQUIST. *Professional Experience*: American Peace Corps; EDAW, Inc., University of New Hampshire. *Fields of Specialization*: Site Planning and Design, Environmental Impact Assessment, Siting and Routing, Synaesthetics.

Introduction

The alteration of the physical environment has been a product of human activity since the earliest times of human settlement. While environments of enduring beauty and vitality occasionally resulted, the history of environmental manipulation more often demonstrated degradation and abuse of the landscape. As the knowledge of natural and human processes has expanded, the scope of environmental design has been transformed over the centuries from the casual efforts of many to that requiring skilled individual effort and often demanding multidisciplinary inputs in response to rapid change.

The School of Landscape Architecture offers curricula designed to educate students to contribute in varied ways to the wise use of land and landscape. Each degree program provides a basis for students to establish career directions in landscape architecture or in related disciplines. These curricula are offered at both the undergraduate and graduate levels.

Undergraduate Program

The School of Landscape Architecture offers two undergraduate degrees—the bachelor of science with a major in environmental studies (B.S.) and the Bachelor of Landscape Architecture (B.L.A.).

Both degrees share the ultimate purpose of providing senior level education for those concerned with the condition and form of the physical environment. The B.L.A. degree is accredited by the American Society of Landscape Architects (ASLA) as the first professional degree. The B.S. degree is granted at the end of four years of study and requires successful completion of 127 credit hours in a prescribed curriculum. The B.L.A. degree is granted at the end of five years of study and requires the successful completion of 160 credit hours in a prescribed curriculum.

Intended curriculum changes will require students to choose at the time of admission either the B.S. or the B.L.A. curriculum by the 1983-84 academic year. Entrance to a separate B.S. program is presently possible with faculty approval.

BACHELOR OF SCIENCE IN ENVIRONMENTAL STUDIES

The B.S. degree with a major in environmental studies requires study in a core of courses. These provide a basic academic exposure to subject matter dealing with the environmental systems and processes, human manipulation of land, and visual quality of the environment. The degree offers each student an opportunity to concentrate in environmental land planning studies and is intended to respond to individual student's needs while adhering to standards of academic vigor and excellence. The objective of the degree is to provide knowledge in basic principles governing the evolution, operation, and vital processes of the physical environment. Graduate study in specific areas of interest is intended to follow successful completion of the degree. The complexity and scope of coursework required by the B.S. degree demands both discipline and commitment from students seeking the degree. Students receiving a B.S. degree have pursued graduate study in the disciplines of planning, architecture, landscape architecture, environmental education, and environmental law.

BACHELOR OF LANDSCAPE ARCHITECTURE

The B.L.A. degree is a professional degree with an emphasis on the skills and knowledge required to qualify as a landscape architect. The degree program consists of a core of courses involving the basic principles of landscape architecture design, land manipulation and engineering, applied ecology, and communications. The major objective of the B.L.A. program is the development of basic proficiency in design, engineering, and communication skills necessary for formal admission into the profession of landscape architecture.

Where desired and when the prerequisite period of work experience has been completed, a person holding a B.L.A. degree may obtain a license to practice landscape architecture. At present, the State of New York requires those holding a B.L.A. degree to complete a three-year period of internship in the field prior to applying for the licensing examination. Other states have varying requirements for obtaining a license.

As in any area of professional study, students seeking the B.L.A. degree are expected to demonstrate a high level of commitment and scholarship in their studies. This professional commitment is demonstrated by a desire to serve society in an objective, rational, and ethical manner in designing the form of the environment.

Students receiving a B.L.A. degree have entered the profession as employees in public agencies or in private offices offering landscape architectural services. Also, B.L.A. graduates have entered graduate schools in landscape architecture, planning, urban design, regional design, and specific specialties including historic preservation, energy conservation, environmental policy management and research.

Graduate Program

MASTER OF LANDSCAPE ARCHITECTURE

The master's degree is offered to those students who hold an undergraduate degree and meet the prerequisites for admission. The three-year course of study provides a strong foundation of design theory and process while emphasizing mastery of the skills associated with an area of specialization. The core curricula focuses on processes of community and urban environmental design. Students are required to integrate the required core of coursework with an elected area of concentration in the social or natural sciences. The program requires cross-disciplinary study to prepare students to enter a variety of emerging positions in the public and private sectors. Illustration of these positions may be found in design research, community development, impact analysis, and environmental management. Although these positions require an understanding of design, they do not demand the traditional skills normally associated with project design. However, skills in management, analysis techniques, technological application, and the social and natural sciences are considered necessary to undertake these and other similar positions. Graduates of the program are currently employed by government, educational institutions and private offices practicing environmental design and analysis across a broad and comprehensive scope or purview. The M.L.A. degree is granted upon the completion of 48 graduate credit hours in a prescribed curriculum.

For study beyond the M.L.A., the College's interdisciplinary Graduate Program in Environmental Science offers the opportunity for M.L.A. students to pursue a Ph.D. degree. This degree is appropriate for those seeking a career in teaching and research. Programs and degree requirements are individually arranged to integrate community environmental design with one or more of the other disciplines represented at the College.

PREREQUISITES FOR ENTRY INTO THE B.S. AND B.L.A. DEGREE PROGRAMS:

Because of the breadth of concern of both the B.S. and B.L.A. degrees, it is imperative that entering students prepare themselves with a broad range of lower division coursework. The environmental efforts with which the students will be involved requires a strong background in both the natural and social sciences. In addition, prior skill development in graphics, mathematics and computer science is required. The following required and recommended prerequisite coursework will prepare the entering student to engage both degrees.

Lower Division Courses

Course Area	*Credit Hours*
Written and Oral Communication	6
Required credit hours in this area should be taken in courses dealing with English comprehension, the basic skills of grammar and composition, and public speaking.	
Graphics	3
A minimum of one semester's work preferably in a course in engineering drawing but mechanical drawing and/or architectural drafting may be selected.	
Natural Sciences	6
Required credit hours in this area must include a course in botany or plant biology. Additional hours should be taken from coursework in ecology*, physical geography, earth science, geology, or environmental geology.	
Social Sciences	3
Required credit hours in this area are to be taken from coursework in U.S. history, sociology, social psychology, social or cultural anthropology, political science, or economics.	
Mathematics	6
Required coverage of college algebra and trigonometry. Students with prior coverage in math who can demonstrate proficiency at time of admission may substitute elective hours for this prerequisite. More advanced math is desirable but not required.	
Computer Science	3
Required course must include introduction to programming utilizing BASIC, FORTRAN, or APL.	
Electives	35
TOTAL MINIMUM LOWER DIVISION CREDITS	62

Students planning to transfer to the School of Landscape Architecture should consider the following as guidelines in selecting their 35 credit hours of electives. The subject areas are considered highly desirable but are not required. Course areas marked (*) are required following transfer to the School, but can be waived if completed prior to transferring. This will allow a student to take additional electives at ESF.

1. In addition to the required prerequisite credit hours listed, further subject coverage in Written and Oral Communications, Natural Sciences and Social Sciences as listed above is recommended.

2. Art and Design
   Courses in this category should preferably include Art History* and Studio Art. Studio courses in Drawing or Three-Dimensional Design, i.e., Sculpture, Ceramics, etc., are recommended.

3. Analytical Tools
   Courses in this category should preferably include Elementary Plane Surveying*, or Air Photo Interpretation*.

Junior Core Year

The B.S. and the B.L.A. degrees share a common junior or third year curriculum with the purpose of developing a basic knowledge of environmental systems, physical geography of land, visual awareness and understanding of landforms, design principles and form, and communication skills. At the conclusion of the third year, each student is asked to select either a B.S. or B.L.A. degree option. This selection is made with a faculty advisor after a complete evaluation of individual career goals and program opportunities.

Junior Year			*Credit Hours*
First Semester	LSA 320	Introduction to Landscape Architecture and Planning	3
	LSA 326	Landscape Architectural Design Studio I	3
	GRA 382	Graphic Communication	2
	EIN 311	Natural Processes in Planning and Design	3
	FBL 320	General Ecology or Elective	3
		Introduction to Computer Programming or Elective	2
			16
Second Semester	LSA 327	Landscape Architecture Design Studio II	3
	LSA 330	Site Research and Analysis	2
	EIN 371	History of American Landscape Attitudes	3
	EIN 390	Social/Cultural Influences and Environmental Form	3
	ERE 306	Elements of Map and Air Photo Interpretation or Elective	1
	ERE 308	Elements of Plane Surveying or Elective	1
	LIB 300	Library Research	1
		Technical Writing	2
			16

BACHELOR OF SCIENCE WITH A MAJOR IN ENVIRONMENTAL STUDIES

Senior Year

Of the total 31 credit hours required during the senior year, 15 credit hours must be taken from the School of Landscape Architecture course offerings. The other 16 credit hours must be taken from the following two general areas:

1. The elements of human settlements and their interrelationship. These electives are usually chosen from courses in history, economics, political and social sciences.

2. The influences on environmental land planning. These electives are usually chosen from courses in resources management, geology, law and public policy, geography.

The specifics of an individual student's senior year are developed by the student and the faculty advisor based on the student's goals and subject to recommendation by the School's faculty.

B.L.A. SENIOR AND FIFTH YEAR

Senior Year			*Credit Hours*
First Semester	LSA 422	Landscape Design Studio III	4
	LSA 433	Plant Materials	2
	LSA 434	Design Materials	1
	LSA 442	Site Grading	2
	LSA 443	Site Drainage Systems	1
	EIN 451	Fundamentals of City and Regional Planning	3
	EIN 471	History of Landscape Architecture	3
			16
Second Semester	LSA 423	Landscape Design Studio IV	4
	LSA 425	Orientation for Experiential Studio	3
	LSA 444	Vehicular Circulation Design	1
	LSA 445	Introduction to Structures	1
	LSA 455	Professional Practice in Landscape Architecture	2
	EIN 470	Art History or Elective	3
		Elective	3
			17
Fifth Year			*Credit Hours*
Summer	LSA 533	Plant Materials	3
First Semester	LSA 524	Experiential Landscape Design Studio V (Off Campus Program)	16
Second Semester	LSA 522	Landscape Design Studio VI—Urban Design	4
	or		
	LSA 525	Landscape Design Studio VI—Site Design	4
	or		
	LSA 527	Landscape Design Studio VI—Regional Design	4
	LSA 545	Professional Practice Studio	2
		Architecture Elective	3
		Elective	3
		Elective	2
			14

NOTE: A number of the courses listed for the B.S. and B.L.A. programs are in the process of being revised. Upon revision, new course descriptions will be available after approval by the College of Environmental Science and Forestry Faculty.

M.L.A. DEGREE PROGRAM

The M.L.A. curriculum has four components; a prerequisite foundation; a sequence of required core courses; a series of elected courses in an area of concentration; and a project or thesis. The prerequisite foundation provides the skill and knowledge basis for engaging environmental design. The required core courses have as their focus the development, enhancement, and refinement of understanding of landscape architectural philosophy, theory, skills, and techniques, as focused on community environments. Emphasis is placed on the refinement of proficiency in design research skills, concepts, and objectives.

Each student is required to select and complete a group of courses in an area of concentration in one of two design-related areas. These areas are in social/behavior studies and natural/physical applied sciences as related to community environmental design. Selection of an area of concentration is the responsibility of each student assisted by a faculty advisor.

Every student is required to prepare a terminal project or thesis which is reviewed by a committee of faculty. A project consists of the critical application of professional knowledge and skills to a landscape architectural problem in order to develop a solution. A thesis consists of research which expands or clarifies basic knowledge related to community environmental design.

In general, the following describes the broad sequential purposes of the six-semester program:

First Year: Completion of prerequisite courses, and start of graduate elective sequence, or engagement of additional undergraduate technical subjects.

Second Year, Fall Semester: The third semester of study is intended to provide an introduction to concepts and design processes, including computer simulations in emerging areas of community and urban environmental design. An examination of the impact of physical factors on the environment is provided.

Second Year, Spring Semester: The fourth semester of study is intended to investigate design through a variety of projects focusing on the form and condition of environments supporting human behavior. Methods of research and analysis relevant to social determinants are introduced.

Third Year, Fall Semester: The fifth semester includes an advance community design studio and elective coursework. The studio may be conducted in Central New York or at a location selected by the student and approved by the faculty which optimizes the fit of subject and environmental context.

Third Year, Spring Semester: The final semester of study consists of intensive work on a project or thesis, as well as continued study in the selected area of concentration. It is anticipated that the project/thesis consists of a study examining an aspect of the area of concentration and its relationship to community environmental design.

Research plays a significant role in the graduate program, primarily through funded projects and projects/thesis. Not only does research provide new knowledge and applications for the profession, but it enriches the curriculum, enhances faculty expertise and develops student skills in rigorous observation, clear thinking and lucid writing.

By the nature of a profession which exists on evolving frontiers of human interaction with natural and built environments, much of the research in landscape architecture deals with issues in an exploratory way. Faculty members and graduate students usually work together on research projects in an atmosphere of mutual learning. Approaches may vary from rigorously quantitative analysis of data to highly qualitative evaluation of broad problems to application of design and planning methods to specific cases.

The College library and the several libraries on the Syracuse University campus offer reference material to support study programs. Facilities at the School are extensive. They include adequate studio and office space as well as reproduction, model making, photographic and audio-visual equipment. The College's Computer Center is fully interfaced with Syracuse University to provide a complete range of academic and research capabilities. The College also has a fully-equipped video tape recording (VTR) studio and photogrammetric labs.

The School is unique in its location within the College of Environmental Science and Forestry. This situation provides the M.L.A. candidate with the opportunity to draw upon information and knowledge in ecology, natural sciences, resource management, forestry and many other related environmental disciplines. The U.S. Forest Service Urban Forestry unit located at the College provides a unique opportunity to promote interdisciplinary environmental design research. In addition, the relationship with Syracuse University provides the School with an extensive intellectual as well as physical resource basis.

The Syracuse area has the largest concentration of landscape architectural firms in the state, outside New York City. With a metropolitan population of nearly 500,000, the city has many opportunities for urban-oriented study. Also, the city's central location in Upstate New York provides easy access to a rich variety of public lands and recreation areas which are planned and administered by a diverse range of governmental agencies and private owners.

Students seeking admission to the M.L.A. program may apply to enter in either the first or second year based on education and experience and must complete the following prerequisites prior to beginning the second year of the program—graduate studio core sequence.

1. An undergraduate degree.
2. Graduate Record Examination scores.
3. Undergraduate transcript.
4. Three letters of recommendation.

5. Design portfolio required for all applicants to second year of program, optional for first year applicants.
6. A written statement of the purpose and goals of seeking a Master of Landscape Architecture in the field of community and urban environmental design.
7. TOEFL scores for those applicants whose native language is not English.

Applications should be made to the College prior to March 1; letters of acceptance from the School are mailed out to the applicant prior to mid-April.

M.L.A. Program Sequence

The M.L.A. program is established as a two-year sequence of courses. The following sequence illustrates a typical two-year program.

First Year:

Design:
Two applied studio courses which examine landscape architectural design theory and process through application to specific projects. Placement is based on portfolio review if submitted.

Landform:
One course which examines the types of landforms that exist in nature and which surveys the adaptation and manipulation of these for new uses.

Graphics:
Introduction to design and technical graphics.

Basic Ecology:
One course which examines the basic scientific principles of natural systems.

Basic Computers:
One course which introduces students to use of computers, including programming.

Social Sciences:
Two courses which introduce students to the scientific study of an aspect of human behavior (e.g., sociology, anthropology, psychology).

Natural Sciences:
Two courses which introduce students to the scientific study of an aspect of the natural sciences (e.g., biology, botany, geology, dendrology).

Electives

Second Year — *Credit Hours*

Fall

LSA 697	Seminar—Topics and Issues of Landscape Architecture	2
LSA 620	Studio I	4
LSA 650	Determinants of Urban/Regional Land Use	3
Elective		3
		12

Spring

LSA 699	Research Methods and Techniques	3
LSA 720	Studio II	4
LSA 653	Environmental Land Use Planning	3
Elective		2
		12

Third Year			*Credit Hours*
Fall			
	LSA 899	Project/Thesis	2
	LSA 721	Studio III	4
	Electives		6
			12
Spring			
	LSA 899	Project/Thesis	12 or 6
	Electives		6
			12

COLLEGE-WIDE PROGRAM IN ENVIRONMENTAL SCIENCE

ROBERT D. HENNIGAN, *Director* (Environmental Management, Policy and Programming, Water Quality and Urban Water Management), ALEXANDER (Wildlife Biology, Wetland Ecology), BENNETT (Forestry Economics), BLACK (Watershed Hydrology, Water Quality), BROCK (Analytic and Interpretative Photogrammetry, Remote Sensing), CANHAM (Resource and Land Use Economics, Regional Planning), CHAMBERS (Wildlife Ecology and Management), CUNIA (Operations Research, Statistics, Mensuration), CURRY (Urban Visual Analysis, General Urban Design), DALL (Legal and Institutional Arrangements for Management of Natural Resources and Environmental Protection, Environmental Policy), DENCE (Organic Chemistry and Lignin Reactions), FELLEMAN (Site Engineering, Environmental Land Use Planning), GEIS (Plant Community Dynamics, Plant-Soil Relationships), GRATZER (Recreation Resource Management and Planning), GRAVES (Resources and Environmental Management, Policy Analysis), HANNA (Transmission Electron Microscopy, Cellular Ultrastructure), HANSELMAN (Education and Communications Strategies, Learning Simulations), HARPER (Regional Resources Analysis, Scenic Assessment), HARTENSTEIN (Soil Macroinvertebrates, Biodegradation), HAWKS (Landscape Architecture, Regional Planning and Design, Facility Siting and Routing), HOLTMAN (Educational Communications, Message Design, Applied Communications), HORN (Legal and Business Aspects of Resources Management and Policy), JELINEK (Computer Applications, Process Design), JOHNSON (Speciation of Heavy Metals in Air, Water and Other Materials), KETCHLEDGE (Plant Science, Ecology, Bryology), LEE (Systems Engineering Computers, Soil Mechanics), LEWIS (City and Regional Planning, Systems Dynamics), LUNER (Mechanical and Surface Properties of Fibers, Films and Paper), MARK (Properties of Woods and Fibers, Solid Mechanics of Cell Walls), MEYER (Wood Polymers, Radiation Chemistry), MITCHELL (Decomposition Processes, Flora-Faunal Interactions), MORRISON (Psychology, Sociology, Environmental policy), NAKATSUGAWA (Detoxification Mechanisms, Health Effects of Pesticides, Pollutants), PALMER (Biomass Energy Systems; Engineering Economics), PAULO (Design, Land Use Planning), POLLAK (Public Policy Decisionmaking, Analysis of Urban Areas), PORTER (Nature Interpretation, Wildlife Habitat Research), RAYNAL (Plant Populations, Community Ecology), SMARDON (Landscape Design, Environmental Impact Analysis, Environmental Planning), SMITH (Physical and Polymer Chemistry), STITELER (Biometry, Experimental Design, Computer Applications), TULLY (Computer Modeling of Stormwater Runoff, Relationships between Hydrologic Models and Water Resources Decisions), TURAI (Water and Air Pollution

Abatement Engineering, Materials Science and Engineering), VAN DRUFF (Urban Wildlife, Wetland and Waterfowl Biology) WEBSTER (Research Methods, Environmental Education and Communications).

Adjunct Faculty

J. ALEXANDER, P. DURKIN, ROBERTSON, ROWNTREE, R. SANDERS, THOMPSON, WEEKS.

A PERSPECTIVE

Environmental science is the study of people and their relationships with the environment. The environment is the physical, chemical, biological, and social setting in which people live, work, and play. Consequently, environmental science is concerned with the natural setting, the culture imposed by man in this setting, and the institutional system man has devised to order the relationships between many conflicting demands and desires in light of natural and social constraints. Few, if any, locations on this earth are totally independent; external dependencies and impacts exist, to a greater or lesser degree, and must be factored into this environmental matrix.

Environmental science connotes a holistic orientation, one that recognizes interdependence and interrelatedness of all the social and technical facets of the environment, as opposed to an atomistic orientation which treats these facets as fragmented and unrelated. Armed with this perspective, it is apparent that the environmental problems facing society today are a product of human interaction with the environment, not simply a number of technological difficulties.

Present day interest and concern with environmental matters had as its antecedents the separate development of conservation and public health programs in the 1880s which had a rather narrow focus. These concerns became progressively broader under the press of social and technological growth in the 40s, 50s, and 60s. A new environmental movement then emerged outside of these traditional approaches culminating in Earth Day, 1970.

This environmental movement enlisted a constituency outside of the conservation and public health traditions and agencies. Conservation and public health elements were combined in a unified approach. The resource focus of conservation and the people focus of public health became merged into the single focus of people and resources. The goal is to maintain acceptable environmental conditions, while simultaneously providing for the effective utilization of resources.

In order to meet the demands for a broader integrative approach to environmental affairs, a number of new statutes were passed, epitomized by the National Environmental Policy Act; new agencies were formed, old agencies were reorganized. The new participants included citizen activists, lawyers, natural scientists, and planners in unprecedented numbers to add to the cadre of professionals and citizen activists from the public health and conservation traditions. One major result of this was the realization that the environment must be viewed holistically, and that there were two major aspects to all environmental issues, the technical-scientific, and the political-social. This requires that all students of environmental science fully understand and comprehend both of these components of environmental affairs.

THE PROGRAM

The Graduate Program in Environmental Science (GPES) resulted from the realization that there is a need to provide an opportunity for interdepartmental and interdisciplinary study. Consequently, the faculty for the program is drawn from the faculty of the existing schools and departments.

Other important inputs to this program are the resources of Syracuse University in the coursework areas of communications, policy, law, engineering, science, sociology and political science, and the community and institutional resources of the region such as federal, state, and local agencies, faculties of other colleges, and private organizations.

PROGRAM OBJECTIVES

The GPES is designed to prepare graduate students for careers in environmental affairs. This includes working in such diverse areas as teaching and research, communications, planning, regulatory administration, general administration, policy and program analysis. The emphasis can be technical-scientific or institutional-social with varying blends of the two.

Students enter directly from undergraduate schools or, as is increasingly happening, after some years of professional experience. The goals of the entering students vary considerably, such as development of needed career skills and expertise, career changes, adding breadth to a technical background, adding depth to a general background, and mid-career updating.

AREAS OF STUDY

Public policy and programming is a major study area which integrates all aspects of environmental science.

The areas of concentration, in addition to policy, now being offered under the GPES are environmental education/communication, environmental assessment and impact analysis, environmental land use planning, water resources, and energy conservation and development. These areas are not exclusionary. It may well be that a student will desire a program that does not fall into the listed categories. This need can be met providing that the faculty resources are available in the College and associated institutions. Students with a desire for a highly individualized program falling within the scope of the

College's offerings are encouraged to make application for admission.

Students with an undergraduate major in engineering, science, mathematics, political science, economics, journalism, public communications, or forestry would be best prepared to undertake a graduate program in environmental science. All applicants must meet the general admission requirements of ESF. Each applicant is evaluated on an individual basis, and judgment is exercised if the student appears to be deficient in some aspects. Considerations include years of experience, maturity, and motivation. Potential applicants should not hesitate to submit applications for consideration. All applicants are urged to visit the campus and confer with appropriate faculty and administrative personnel.

REQUIREMENTS

Program requirements are designed on a highly individual basis. The purpose is to design a program that fits the students' particular needs, goals, and preparation. Each program must meet the need for *depth* in a particular area, *breadth* across the environmental spectrum, and *synthesis* of information and analysis in evaluating environmental situations. Program evaluation is based on undergraduate work and experience, as well as courses taken at the College. The program must also be coherent, logical, and result in a meaningful whole. Current areas of study are:

Environmental Policy

GPES is the policy center for the College. As such, it is involved and concerned with the public policy and programming aspects of the entire spectrum of environmental conservation and protection. Consequently, policy study is the integrating force bringing all concentration study areas together in pursuit of the common goal of meaningful and effective research and education in environmental science.

Environmental policy studies prepares individuals for leadership positions in the formulation and execution of public policy and the implementation of programs related to Environmental Conservation and Protection. Studies deal mainly with the decision processes of governmental systems including public involvement and provide integrated knowledge of environmental science and the evaluative techniques of economics, political science, public administration and law.

Environmental Education/Communication

The Environmental Education/Communication area of study is concerned with those facets of environmental protection, enhancement, management, and design in which the flow of information and the processes of education are integral to end results. The basic emphasis is to integrate a solid and substantial background in environmental science with a mastery of appropriate education and communications theory and practice in such a manner as to prepare students in the program for careers in environmental education and communications.

Although closely related, there are several rather distinct career areas under the umbrella of EE/C for which this program unit provides preparatory graduate degree training. These career areas can be generally categorized as follows: Public Information Officer, Environmental Education Specialist, Extension Specialist, Interpretive Naturalist, Environmental Journalist.

Water Resources

The Water Resources area of study is based on the recognition that water relationships are important in almost every aspect of human concern and merit attention as integrative and central elements rather than accessories.

The thrust of the program is either technical or social depending on student interest. The technical aspect is concerned with water quality and quantity relationships, their quantifications and determinants. The social aspect is concerned with planning, regulation, law and institutions, and management. National concern with water resources planning, water supply, and water pollution control attest to the need for people trained in these areas.

Environmental Assessment and Impact Analysis

The main objective of this area of study is to bring together, in an organized educational unit, the various skills and disciplines required for an environmental impact analysis. In practice, such an analysis is a team effort, and the program is intended to ensure that potential team members are conversant with, and operationally adapted to, the language and procedures of a number of the disciplines involved. Starting with students who have an in-depth background in a traditional (i.e., chemistry, biology, engineering, ecology, forestry, et al.) discipline, the program seeks to refine existing strengths while at the same time broadening the students' ability to deal effectively with the complex, interdisciplinary problems which arise in studies of environmental impact. To ensure the depth and breadth aspects simultaneously, the academic plan stresses a problem-oriented team research approach.

Environmental Land Use Planning

The land use planning area of study is based on the concept that land use is a fundamental determinant of environmental conditions, be it water pollution, air pollution, population density, solid waste disposal, or other impacts. The program is designed to acquaint the student with the physical elements of land use such as location and natural resources, and the social side relating to law, economics, and regulation. Land use management and control is fast becoming the major environmental issue of the day. Land use planners and implementors are sorely needed on a local and regional level. This program unit proposes to meet that need.

Energy Conservation and Development

The energy concentration provides a framework within which a student can study energy-environment-economy relationships with a focus on renewable resource alternatives to social energy resource requirements. Because of the interdisciplinary nature of the subject, opportunities are available for a wide variety of academic studies which combine and integrate physical and social considerations.

Additional Area

This is not a specific area of study but a program element to provide for the highly individual program designed to meet a particular student's needs. Special provisions may be made for a study concentration not listed. The emphasis can be on any appropriate subject within the resources of the College and related institutions.

THE STUDENT

A major advisor is assigned by the program director to accept primary responsibility for the program of each student. Two additional faculty members in areas of expected academic or research emphasis are also selected. These three faculty members constitute the academic program committee for the student. The student is required to submit a formal proposal to the committee consisting of a detailed plan describing and defending the academics and research objectives of the program and a schedule of courses to be taken. The plan is reviewed and updated at the beginning of each semester. The program committee also serves as the thesis or project committee.

The program operates within the College-wide requirements for graduate students. All students in the program are required to participate in the environmental science seminar which brings together a variety of lecturers with a wide spectrum of interest. Communication, and a campus visit and an interview are highly recommended prior to or during the application process.

THE SCHOOL OF FOREST TECHNOLOGY

JAMES E. COUFAL, *Director* (Silviculture, Forest Management, Pathology, and Personnel Management)

LUNK (Wildlife Ecology, Graphics, Entomology, Silviculture, and Recreation), MARTIN (Mensuration, Statistics, Wildlife Ecology, Tree Physiology and Morphology), MILLER (Forest Roads, Installations, Recreation, and Policy), REMELE (Ecology, Silvics and Silviculture, Forest Management, and Aerial Photogrammetry), STERBENZ (Surveying, Graphics, Computer Science, and Remote Sensing), SUHR (Water Resource Management, Dendrology, Entomology, and Aerial Photogrammetry).

FOREST TECHNICIAN PROGRAM

In 1912, some 1,800 acres of land in the Adirondack Mountains were donated to the College as a site for the development of a Ranger School. Since that time, the forest technician program has trained more than 2,900 graduates, most of whom are now working in a variety of forest activities, and it has earned the School a national reputation for excellence.

The two-year curriculum trains students as forest technicians. The degree of Associate of Applied Science in Forest Technology (A.A.S.) is awarded. The objectives of the curriculum are to provide students with a knowledge of the field practices of forestry as related to forestry managerial needs; the ability to work and communicate effectively with professional and paraprofessional forestry personnel; and an understanding of the sciences and practices of forestry with some emphasis on ecological applications.

Graduates are generally classified as forest technicians or forestry aides in initial employment positions. Forestry agencies and wood-using industries employ forest technicians as an important part of their forest management teams, usually as the "people on the ground" who plan and execute the field practice of forestry normally under the supervision of a professional forester.

Since the curriculum is a terminal, two-year program at the paraprofessional level, students interested in a professional degree in forestry should investigate enrollment directly in one of the College's undergraduate programs. Transfer into some of these programs is possible upon completion of the A.A.S. degree. Further, while there is a real value and need for forest technician training at the A.A.S. level, a concept fully backed by the total College, graduates must appreciate the fact that they are not considered professional foresters upon completion of the A.A.S.

The freshman year forest technology curriculum consists of general studies courses which may be taken at any accredited four-year college, community or junior college, or agricultural and technical institute.

The second year of the curriculum is offered at the College's School of Forest Technology on the Wanakena Campus. Presented in a varied forest environment, the curriculum's emphasis is on applied field training and on the relationships between forest technology and managerial needs. Fifty percent of the studies are devoted to field exercises, most of which are held in the School's forest. This managed forest, containing both hardwood and coniferous species, covers an area some 3½ miles long with widths varying up to 2¼ miles. On two sides, the forest is bounded by State Forest Preserve lands. The forest is also adjacent to an area of several square miles of virgin timber within the Adirondack Forest Preserve. This excellent forest backdrop for the technology program provides a diverse laboratory for instructional purposes.

Since the School is situated within a forest environment, some applicants to the forest technology program may mistakenly believe that the program is one of forest lore and wilderness survival. It is, therefore, strongly emphasized that the forest technology curriculum demands high quality academic achievement. Students cannot complete the program without concentrated and consistent study. Classes are scheduled from 8 a.m. to 5 p.m., Monday through Friday, with classroom and laboratory or field time equally divided. The intensity of the program normally requires a minimum of 70 hours a week of evening and weekend study, daily classes, and laboratory/field exercises. Several short trips, at no additional expense to the student, are made during the year in connection with courses in logging, forest recreation, forest mensuration and silviculture. A longer trip of seven days' duration emphasizing regional forestry practice is sponsored during the spring semester of the second year. Students must bear their proportionate share of the cost of this field trip which consists primarily of air fare, lodging and meal expenses.

LIFE AT WANAKENA

The Wanakena Campus of the College of Environmental Science and Forestry is located on the banks of the Oswegatchie River near the picturesque hamlet of Wanakena, approximately 65 miles northeast of Watertown, and 35 miles west of Tupper Lake. The School's buildings and its surrounding forest border on the river which flows directly into Cranberry Lake.

The main School building consists of a central service unit with dormitory wings on either side. The central unit contains classrooms, laboratories, a student lounge, faculty offices, the library, a kitchen, dining room and 47 student rooms, each housing two students.

Faculty living quarters are nearby on the campus. Other buildings include a maintenance shop, garages, a sugar house, and storage buildings.

The close proximity of faculty offices and student quarters and the intensive field-work pattern enables students to consult easily and frequently with the faculty. The School considers this traditional close student-faculty association to be of major benefit in its training program.

A small library of approximately 1,500 volumes consists of highly specialized materials required for the teaching and study programs of the School.

Students taking the second year of the forest technology curriculum at the Wanakena Campus are required to live in the School's dormitories. An exception may be made for married students who bring their families and rent their own private accommodations in the vicinity. Such accommodations are not plentiful. Each married student should make rental arrangements well in advance of the registration date.

The Wanakena Campus does not maintain an infirmary, nor does it employ a physician or nurse. There are two excellent physicians and a dentist as well as an excellent Community Hospital in nearby Star Lake, New York. In emergency situations, the School transports sick or injured students to the local physician of their choice or to the hospital. A student accident or sickness insurance plan is available through the Wanakena Campus, and it is strongly suggested that the student consider such coverage before reporting to the Campus.

Because of the comparatively isolated location of the Wanakena Campus, a stock of books and supplies used in connection with the second year of the program is maintained on campus for sale to students.

During the first year of the program, College-enrolled students will be guided by the rules and regulations that govern attendance at their local campus. During the second year of the program, students will be guided by the general rules and regulations for College of Environmental Science and Forestry students and an additional set of Wanakena Campus "house rules."

ADMISSION

Admission Requirements

Requirements for entrance into the forest technology curriculum require a minimum of high school units consisting of: English; history (social science); science (including biology); mathematics (including trigonometry or Math 11); and electives. Mechanical drawing is a suggested elective.

In addition to the academic requirements, the following must also be met by all applicants:

1. The applicant must be strongly motivated toward a career as a forest technician.
2. The applicant must be willing and able to meet the physical requirements of the program which include pole and tree climbing, walking 2 to 6 miles through forest areas often carrying 15-20 pounds of equipment, and using a wide array of hand tools and power equipment.
3. The applicant's parents (if the applicant is under 18 years of age) must be fully aware of the field nature of the study program, its rigorous study-work regime and supporting academic facilities.
4. A full medical examination report must be submitted.

Questions concerning any of these requirements should be referred to the Director of Admissions who may, under special circumstances, waive some of them.

Admission Procedures

The decision to admit any student to the Forest Technician Program rests solely with the College of Environmental Science and Forestry. Most openings in the program are filled by students who received conditional acceptances while still seniors in high school, contingent on successful completion of the first year of college. Remaining openings are filled by transfer students who have already attended college. Therefore, it is suggested that the potential forest technician student apply while still a high school senior.

Here is the procedure:

1. Seniors in high school must submit a regular SUNY freshman application for the College of Environmental Science and Forestry, using a Curriculum Code 620 (Forest Technology). These applicants should indicate entry date to be one year in advance of the current year.
2. Submit a regular application to that school selected for the first year of study, using Curriculum Code 620. It is important that students gain entry on their own for the first year of studies. The College will request information at a later date concerning what institution the student will be attending.

Transfer Students

Students with previous college experience, or students who are currently enrolled at another college, may apply for transfer. However, courses transferred for credit can be applied only to the freshman year course of studies, and they must be appropriate to those courses and comparable in subject matter, content, and level. All second year courses must be taken at the Wanakena Campus and, therefore, a student cannot transfer any previously earned credit toward the second year. Transfer applicants must submit a recent official copy of their college transcript and a list of courses they anticipate completing prior to enrollment.

EXPENSES

Cost of the first year will vary with the specific institution attended.

Estimated costs of the second-year program on the Wanakena Campus are as follows:

	Tuition	*Board & Room*	*Books & Supplies*
New York Resident	$ 900	Approx. $1,600	Approx. $375
Nonresident	$1,500	Approx. $1,600	Approx. $375

An additional estimated expense of $150 will likely be incurred to cover the cost of laundry and clothing. The cost of the seven-day regional forestry practice trip during the spring semester is estimated at approximately $250.

There is also a $20 graduation fee and a $10 student activity fee, plus a $50 residence deposit and a $25 equipment deposit. The latter two fees are fully or partially refundable, depending on breakage charged to a student during the year.

FOREST TECHNOLOGY CURRICULUM
(Associate of Applied Science Degree)

Freshman Year — *Credit Hours*

(Completed at a college of the student's choice)

	Credit Hours
[1]General Biology	8
English	6
[2]Math	6
Economics	3
[3]Electives	7
	30

[1]Courses selected may be in general biology, but at least one course in introductory botany is preferred.

[2]Competency in plane trigonometry and college algebra is required. If demonstrated, credits become electives. If a student feels transfer to a baccalaureate program is a possibility, he would be well advised to take calculus.

[3]*If* a student feels transfer to a baccalaureate program is a possibility, general chemistry and/or physics would be most appropriate electives.

Senior Year
(Wanakena Campus)

			Credit Hours
First Semester	FTC 200	Dendrology I	2
	FTC 202	Plane Surveying I	4
	FTC 204	Forest Mensuration and Statistics I	3½
	FTC 206	Forest Ecology	3
	FTC 207	Aerial Photogrammetry	2
	FTC 208	Forest Installations	3
	FTC 213	Forest Protection I	2
	FTC 223	Graphics	1
			20½
Second Semester	FTC 203	Plane Surveying II	1
	FTC 205	Forest Mensuration and Statistics II	2
	FTC 209	Forest Roads	2
	FTC 211	Silviculture	2½
	FTC 212	General Forestry	1
	FTC 214	Personnel Management	1½
	FTC 215	Timber Harvesting	2
	FTC 217	Forest Management	2½
	FTC 218	Forest Recreation	1½
	FTC 219	Elements of Wildlife Ecology	1½
	FTC 221	Water Resource Management	2
	FTC 225	Regional Forestry Practices	1
	FTC 227	Forest Protection II	2
	FTC 228	Structure and Growth of Trees	1
	FTC 229	Silviculture II or	2
	FTC 230	Plane Surveying III	
			25½

A total of 76 credit hours is required. Upon satisfactory completion, an Associate of Applied Science (A.A.S.) degree in Forest Technology will be awarded.

FINANCIAL ASSISTANCE

Financial aid is available upon acceptance to the College of Environmental Science and Forestry. There are three basic loans, scholarships or grants, and part-time employment.

More detailed information on these financial aid opportunities can be found on pages 32-36 of this catalog and the publication *Financial Assistance at ESF.*

The student must file an application with the Office of Financial Aid at the Syracuse Campus and submit a *Financial Aid Form* to the College Scholarship Service, Princeton, New Jersey 08540.

PLACEMENT

The School assists in placement of graduates. The reputation of the College's Forest Technology School usually results in graduates being readily able to find employment. Employment is common with local, state and federal forestry, and land resource agencies, private forestry enterprises, and surveying firms. Positions most frequently filled by recent graduates include: state forest ranger, state forest technician, forest aid, industrial forest district supervisor, timber inventory specialist, timber sales supervisor, forest surveyor, forest engineering aid, forest protection technician, forest research technician, and forest equipment salesman.

Graduate Exchange Programs

INTERCAMPUS DOCTORAL EXCHANGE

There is an opportunity for doctoral students at ESF to study for one or two semesters at the following schools: State University Centers at Albany, Binghamton, Buffalo, or Stony Brook; City University of New York; or New York University.

This exchange program provides students with an opportunity to take advantage of over 160 faculty, specialized research laboratories and equipment, technical libraries, and field study areas which complement the extensive programs and resources at ESF which are discussed throughout this catalog.

This fellowship provides a grant-in-aid of up to $5,000 a year plus a tuition waiver. For further information, please contact the Office of Academic Programs.

COLLEGE OF AGRICULTURE AND LIFE SCIENCES AT CORNELL UNIVERSITY

The State University of New York College of Environmental Science and Forestry and the New York State College of Agriculture and Life Sciences at Cornell University provide an opportunity to exchange graduate students so they can take advantage of special courses, faculty, and research facilities.

There are a number of programs on both campuses which complement one another. The following research and instructional areas at the College of Agriculture and Life Sciences appear likely to be of greatest interest to ESF students.

Agricultural Economics—Land Economics; Resource Economics; Resource Investment and Environmental Quality; Agricultural Land Policy.

Agricultural Engineering—Physical Analysis of Plant and Animal Materials; Soil and Water Engineering; Environmental Systems Analysis; Drainage Engineering; Soil and Water Conservation.

Agronomy—Identification, Appraisal and Geography of Soils; Soil Fertility Management; Soil and Water Conservation; Aquatic Plant Management; Forest Soils; Soil Microbiology; Microbial Ecology; Use of Soil Information and Maps as Resource Inventories; Soil Organic Matter; Soil Chemistry; Weed Science; Dynamic Climatology; Physics of Clouds, Rain, and Rainmaking.

Natural Resources—Wildlife and Fisheries Management; Environmental Conservation; Resource Analysis and Planning; Woodland Management; Forest Ecology; Maple Syrup Production.

Floriculture—Woody Plant Materials; Herbaceous Plant Materials; Plants and Design.

Entomology—Insect Pest Management; Arthropod Pests of World Importance; Biological Control; Insect Pathology; Environmental Biology; Pesticides in the Environment.

Plant Breeding and Pathology—Plant Cell Genetics; Methods of Plant Breeding; Genetics and Breeding for Disease and Insect Resistance; Plant Pathology; Advanced Disease Control; Dendropathology; Pest Management for Plant Protection; Advanced Mycology; Plant Virology; Plant Nematology; Bacterial Plant Pathogens; Disease Physiology; Philosophy of Plant Pathology; Taxonomy of Fungi; Pathology of Trees and Shrubs.

Pomology—Tree Fruits; Orchard Management; Growth and Development of Woody Plants.

Rural Sociology—Rural Development and Cultural Change; Political Structure and Development; Social Power and Community Change; Political Economy of Rural and Regional Development.

For detailed information please contact the Office of Academic Programs.

Course Offerings

Students at the College of Environmental Science and Forestry have not only the academic and research resources of their own institution, but also the resources of nearby Syracuse University and State University Upstate Medical Center.

COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY COURSE DESCRIPTIONS

The courses offered by the College are grouped by general subject areas, and the number of credit hours appears after the course title. A credit hour means one recitation (or lecture) hour per week. Three laboratory hours are equivalent to one lecture hour.

The semester and year after each course indicates when it will next be offered. The College reserves the right to alter the scheduled offering of a course when its enrollment is too small, or when there is no qualified faculty member available to teach it.

Course Numbering System

Code Levels:

100-299 Lower-division undergraduate courses for which no graduate credit may be given.

300-499 Upper-division undergraduate courses for which no graduate credit may be given.

500-599 Graduate courses designed expressly for areas of specialization in post-baccalaureate programs or in the professional program leading to the Bachelor of Landscape Architecture. Undergraduate students with superior academic records may register for these courses.

600-699 Graduate courses which permit undergraduate students to enroll only by petition with a well-documented justification approved by the undergraduate advisor, curriculum director, and course instructor.

700-999 Graduate courses for which no undergraduate may enroll.

General Subject Areas

APM—Applied Mathematics 128
ENS—Environmental Science 130
ERE—Engineering (Environmental and Resource Engineering) 131
EST—Environmental Influences (Landscape Architecture) 129
EST—Environmental Studies 137
FBL—Biology (Forest Biology) 138
FBO—Botany (Forest Botany and Pathology) 140
FCH—Chemistry 144
FEG—Forest Engineering 149
FEN—Entomology (Forest Entomology) 150
FOR—Forestry (Resources Management) 153
FTC—Forest Technology 158
FZO—Zoology (Forest Zoology) 161
GRA—Graphics (Landscape Architecture) 164
LIB—Library (College of Environmental Science and Forestry Course) 165
LSA—Landscape Architecture 165
PSE—Paper Science and Engineering . 171
RMP—Resource Management and Policy 173
SCE—School of Continuing Education 175
SIL—Silviculture 176
WPE—Wood Products Engineering ... 178

APM—APPLIED MATHEMATICS

360. Introduction to Computer Programming **(3)**
The basic course in computer use offered by the College. It is intended to provide the student with the skill and understanding needed to utilize digital computer languages or problem solving. The course will cover instruction in FORTRAN IV, and an ASSEMBLY language plus some discussion of PL/1, ALGOL, APL, and use of software operating systems. This course or a demonstrated equivalent is a prerequisite to individual student use of the College computer facilities. Fall and Spring, 1980-81.

391. Introduction to Probability and Statistics **(3)**
Two hours of lecture, three hours of laboratory. Elementary probability, theoretical and sampling distributions, hypothesis testing, statistical estimation, analysis of variance, regression and correlation, nonparametrics and sampling concepts. Fall and Spring, 1980-81.
Prerequisite: Two semesters of calculus.

492. Forest Biometrics **(3)**
Two hours of lecture, three hours of laboratory. Analysis of variance including nested and cross-classification. Matrix approach to multiple linear regression and weighted least squares. Nonlinear regression. Sampling methods and design. Applications to forestry problems. Fall, 1980.

500. Introduction to Computer Programming for Graduate Students **(3)**
This basic course in computer use offered by the College is intended to provide the student with the skill and understanding needed to utilize digital computer languages for problem solving. The course includes a rather detailed study of FORTRAN IV, plus some discussion of an ASSEMBLY language and moderate study of COBOL and APL. To provide completeness, some attention is also afforded to techniques of representing information, managing files, error control and to operating systems and job control. This course or a demonstrated equivalent is a prerequisite to individual student use of the College computer facilities. Fall and Spring, 1980-81.

605. Theory of Probability Distributions **(1-3)**
Three hours of weekly sessions over five to 14 weeks. Statistical problems and mathematical models; random experiments, random variables, probability, frequency and distribution functions of discrete, continuous and mixed random variables; functions of random variables and the probability distributions; mathematical expectation and its applications; discussion of the main theoretical distributions such as binomial, Poisson, negative binomial, normal, Gamma, Beta, exponential and others; applications of this framework to the model construction problem in the statistical, operations research and forest mensuration areas. Fall or Spring, 1980-81.
Prerequisites: Two semesters of differential and integral calculus and an introductory course in statistics, or permission of the instructor. The course can be taken in conjunction with APM 651—Operations Research I (for one credit hour) or independent of it for one to three credit hours.

510. Statistical Analysis **(3)**
Two hours of lecture and three hours of laboratory. A treatment of statistical inference, including paired design, group design, linear regression and correlation, one way analysis of variance and some applications of chi-square. Calculation of statistics, test of hypotheses and proper interpretation of calculated statistics. Fall, 1980.

620. Analysis of Variance **(3)**
Three hours of lecture and recitation and three hours of laboratory. Multiway classifications in the analysis of variance, with emphasis on the development of models, including randomized blocks, latin squares, split plots, and factorial designs with fixed effects, random effects, and mixed effects; multiple and partial regression and correlation (including curvilinear), using matrix methods; analysis of covariance. Fall, 1980.
Prerequisites: Graduate standing and an introductory course in statistics covering material through the one-way analysis of variance.

625. Introduction to Sampling Techniques **(3)**
Two hours of lecture and three hours of laboratory. Introduction to the scientific basis of sampling: selecting an appropriate sampling unit; choosing an efficient design; calculating sampling error; determining a sample size to meet stated objectives. Spring, 1981.
Prerequisite: APM 391 or equivalent.

630. Regression Techniques with Applications to Forestry **(3)**
Two one-and one-half hours of lecture. Review of matrix algebra, probability theory and statistical methods. Basic concepts in regression analysis. Classical linear regression model. Least and weighted least squares method. Dummy variables and their uses in regression and covariance analysis. Applications to problems of statistical prediction and estimation from the field of forestry in general and forest mensuration and inventory in particular. Fall, 1980.
Prerequisite: APM 391 or equivalent.

635. Multivariate Statistical Methods **(3)**
Estimation and inference for the multivariate normal distribution. Multivariate analysis of variances, factor analysis, principal components analysis, canonical correlation, discriminant analysis, cluster analysis. Spring, 1981.
Prerequisite: One semester of statistics.

651. Operations Research I **(3)**
Two one- and one-half hours of lecture. Stochastic OR models applicable to managerial process or systems analysis. Elements of probability theory, theory of games and decision theory, queuing model, simulation techniques with applications to queuing and inventory problems, and, if time permits, Markov chains. Fall, 1980.
Prerequisites: APM 391 and MAT 227 or equivalent.

652. Operations Research II **(3)**
Two one- and one-half hours of lecture. Deterministic OR models applicable to managerial problems or systems analysis. Elements of Matrix Algebra, solving simultaneous linear equations, mathematical programming, classical optimization techniques, Lagrange multipliers. Linear progamming transportation and allocation models, dynamic programming, network analysis and, if time permits, quadratic, parametric and integer programming. Spring, 1981.
Prerequisites: APM 391 and MAT 227 or equivalent.

EST—ENVIRONMENTAL INFLUENCES (LANDSCAPE ARCHITECTURE)
(See also courses listed under GRA and LSA.)

311. Natural Processes in Planning and Design **(3)**
Section 1: Landform and Soils
Section 2: Hydrology, Climate and Energy
Section 3: Plant, Animal, and Human Ecology
Three hours of lecture. This course presents an overview of the basic principles governing the dynamics of natural resources and processes which should be understood in planning and designing the human landscape. In each section, sources of reference data application to planning and project scale design will be discussed. Occasional local field trips will be utilized. Fall, 1980.
Prerequisite: Permission of instructor.

371. History of American Landscape Attitudes **(3)**
Three hours of lecture-discussion per week. This course presents, through lectures, readings, and slides, uniquely American historical attitudes toward land and nature as shown through various cultural activities and disciplines, such as painting, architecture, landscape architecture, religion, philosophy, utopianism, exploration and recreation, land development and economics, and certain technological developments. Cultural expressions of the 19th century will be of primary interest, but formative attitudes from the Colonial period and certain 20th century results will be included. One-third to one-half of lecture periods are given over to student reports, criticism, and discussion. Spring, 1981.
Prerequisite: Permission of the instructor.

390. Social/Cultural Influences and Environmental Form (3)
Three hours of lecture. This course provides an introduction to an interdisciplinary social science analysis of human settlements. The course introduces the basic concepts, vocabulary, theories, and units of analysis for an interdisciplinary social perspective of the environmental form of human settlements. As such, it focuses upon developing an understanding of the context for the planning and design of human settlements. Course requirements include readings, examinations, and reports. Field trips may be scheduled. Spring, 1981.

451. Fundamentals of City and Regional Planning (3)
Three hours of lecture per week. An introductory survey course in planning. The historical development of American City and Regional Planning, theories of the planning process, the role of planning in public decisionmaking, landmark legislation and judicial decision related to planning, and approaches to controlling land use will be presented. Fall, 1980.

452. Simulated Planning in Metropolitan Systems: Theory and Practice (3)
Three hours of laboratory, two hours of lecture/discussion per week. A computerized simulation designed to provide an understanding of the decisionmaking environment of metropolitan planning. Each participant is asssigned a role consistent with his/her background. Lectures provide a theoretical framework for the activities in the simulation; a discussion section provides for evaluation. Computer experience is not necessary. Spring, 1981.

470. Art History (3)
Three hours of lecture. Informal lectures will emphasize and review assigned text and other readings and handout notes. Slides will be shown regularly; reports, quizzes and examinations. Evolutionary nature of the main cultural periods of Western man and fine art as man's selected environment will be the course emphasis. Spring, 1981.
Prerequisite: Permission of the instructor.

471. History of Landscape Architecture (3)
Three hours of lecture. Informal lectures and class participation, reports, assigned text and assigned reserve shelf reading, optional text and handout notes, quizzes and exams. Slides. Historical study and style analysis of Western man's efforts to design his environment and his changing attitudes and relationships to environment. Also, non-Western coverage where significant or influential on Western Man. Study of historical personalities as well as periods that are of environmental concern up into the modern period. Fall, 1980.

510. Creative Problem Solving Seminar (3)
Three hours of lecture and discussion. A course designed to extend the student's understanding and application of creative problem solving processes. One requirement will be to select and carry out an application of the techniques to a particular problem, with consultation and guidance from the instructor. Critique and survey of the literature on creativity, in-depth analysis of the synectics process, and various procedures which have been developed for nurturing creative behavior comprise the essence of the program. Fall and Spring, 1980-81.
Prerequisite: Undergraduate degree or permission of instructor.

ENS—ENVIRONMENTAL SCIENCE

797. Environmental Science Seminar (1-2)
Discussion of current topics and research related to environmental science. Fall and Spring, 1980-81.

798. Problems in Environmental Science (Credit hours to be arranged)
Specialized study in the problem areas of Environmental Science for graduate students. Tutorial conferences, discussions, seminars, workshops, and critiques scheduled as necessary. Comprehensive report required for some subjects. Fall and Spring, 1980-81.

899. Master's Thesis Research (Credit hours to be arranged)
Research and independent study for the master's degree and thesis. Fall and Spring, 1980-81.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1980-81.

The following courses offered by the College and Syracuse University are especially useful to graduate students in GPES:

School of Forestry

RMP 587	Environmental Law
RMP 588	Law of Natural Resources Administration
RMP 602	Resource Economics
RMP 603	Research Methods
RMP 629	Environmental Impact
RMP 641	Soil and Water Conservation
RMP 642	Water Quality Management
RMP 643	Urban Water Resources
RMP 753	Resources Policy

School of Environmental and Resource Engineering

ERE 612	Energy

Syracuse University

GEO 613	New York State: Problems and Prospects
GEO 558	Environmental Quality Analysis
GEO 790	Economic Growth and the Natural Environment
PLA 626	Planning and Policy Analysis
PPA 631	Advanced Public Administration
PPA 701	Washington Seminar: Public Policy and Administration
PPA 707	National Planning
PPA 743	Administrative Law
PPA 745	Intergovernmental Relations
SOC 704	Science, Technology and Society
PTS/NAS 532	Progress and Technology
PTS/NAS 551	Alternative Futures for Technological Society
LPP 675	Environmental Issues in Management

ERE—ENGINEERING (ENVIRONMENTAL AND RESOURCE ENGINEERING)

306. Elements of Map and Air Photo Interpretation **(1)**
Two hours of lecture and three hours of laboratory per week for five weeks of a semester. Introduction to map and photograph interpretation to extract information useful to site inventory, analysis, planning, and design activities. The physical and geometric properties of maps and photographs, the characteristics of information contained in them, and the principles and procedures of interpretation are discussed. Spring, 1981.
Prerequisite: Junior standing in Landscape Architecture.

308. Elements of Plane Surveying **(1)**
Two hours of lecture and three hours of laboratory per week for the last five weeks of the semester. Introduction to the principles and procedures of plane surveying for mapping and construction layout purposes. Topics briefly discussed include the basic mathematical principles of surveying, the types and uses of surveying, horizontal and vertical distance measurement, angle measurement, traversing and computations, construction layout, tacheometry, and surveying errors (and their treatment). Spring, 1981.
Prerequisites: Junior standing in Landscape Architecture and college level plane trigonometry.

320. APL for Engineers and Scientists **(2 or 3)**
Programming and operation of time-sharing digital computer systems via the APL language. Analysis, modeling, and solution of basic problems in environmental science and engineering.

Students desiring three credits will complete an original, substantial term project. Fall or Spring, 1980-81.

Prerequisites: Calculus and physics or permission of the instructor.

321. Analog Computation for Engineers and Scientists (1 or 2)

Programming and operation of electronic analog computers. Analysis, modeling, and simulation of dynamic phenomena and systems in environmental science and engineering. Students desiring two credits will complete an original term project. Fall or Spring, 1980-81.

Prerequisites: Calculus and physics or permission of the instructor.

342. Hydraulics in Construction (4)

Three hours of lecture, three hours of laboratory. The physical, mechanical, thermal, and hydraulic properites of fluids relevant to the construction industry. A study of solutions to hydraulic problems in contemporary construction activities. Not open for credit to forest engineering students. Spring, 1981.

Prerequisites: Physics and differential calculus.

350. Wood Preservation (2)

Two hours of lecture with some demonstrations. A survey of basic wood-water relationships, shrinking and swelling, elementary wood structure, wood permeability, capillary forces, heat transmission, agencies of wood deterioration, wood preservation processes, wood fire performance, fire tests, and fire retardant treatments. Not open to WPE students. Fall, 1980.

360. Structure and Properties of Wood (2)

One hour of lecture, three hours of laboratory. Structure of wood in relation to defects, properties and uses. The variability of wood. Identification of major U.S. timbers by gross feature. Spring, 1981.

362. Mechanics of Materials (3)

Three hours of lecture. Theories of stress, deformation, and stability of common structural materials subjected to various force systems. Spring, 1981.

Prerequisites: Integral calculus and statics.

371. Surveying for Engineers (3)

Two hours lecture and recitation, three hours of laboratory. The principles of plane surveying for engineers. Subject matter areas include introduction to theory of measurement and errors, linear and angular measurements in both the horizontal and vertical planes, traversing and computations, horizontal and vertical control and associated computations, areal and volumetric computation, circular and parabolic curves, state plane coordinates, angular direction determination, public land surveys. Laboratory field work and computations culminate in a topographic map. Fall, 1980.

Prerequisites: Differential and integral calculus.

375. Elementary Corrosion (1)

One hour of lecture. Basic electro-chemistry, film formation and passivation, galvanic corrosion and pitting, cathodic and anodic protection, protective coatings and inhibitors. Application of the above in the home, car, field, at sea, and in industrial plants. Spring, 1981.

377. Process Control (3)

Three hours of lecture. The study of the basic principles of process control as applied both with or without electronic computers. The emphasis is on sensing and control elements, signal transmission, and noncomputerized controls. This course complements computer courses but does not go beyond the transmission of signals to computers and the response to return signals. Spring, 1981.

Prerequisite: Physics.

420. Computer Applications in Science and Engineering (3)

Principles and methods of mathematical modeling for analog and digital computer solution. Applications to data reduction and correlation, statistical analysis, process and equipment

simulation, optimization and control, and computer-assisted instruction. Typical examples, class problems and student projects. Current status and future projection of computation equipment, software and operating techniques. Fall or Spring, 1980-81.
Prerequisites: Calculus and computer programming, or permission of the instructor.

440. Water Pollution Engineering (3)
Two hours of lecture and three hours of laboratory. Introduction to the physical, chemical, and biological parameters of waste water treatment processes and to the principles of the unit operations involved. Study of the design parameters and design procedures of waste water treatment systems. Spring, 1981.
Prerequisites: Physics and CHE 356 or equivalent.

441. Air Pollution Engineering (3)
Three hours of lecture and discussions. Study of the chemical, physical and meteorological principles of air pollution and its control. Local and global effects of air pollution. The atmospheric survey. Examination of the operating principles and design parameters of the various air pollution control systems. Air quality and emission standards. Spring, 1981.
Prerequisites: Physics and CHE 356 or equivalent.

488. Engineering Economics (1)
This course provides students with the tools to understand the economic aspects of engineering and to evaluate engineering proposals in terms of worth and cost. Coverage extends through alternatives analysis, using rate of return, present worth, average annual cost and other methods, and evaluation of public activities focusing on benefit-cost analysis. General depreciation and income tax accounting are introduced. Fall or Spring, 1980-81.

496. Special Topics (1-3)
Lectures, readings, problems, and discussions. Topics as announced in the areas of environmental or resource engineering. Fall and/or Spring, 1980-81.

563. Photogrammetry I (3)
Two hours of lecture and discussion, three hours of laboratory and discussion. Basic photogrammetric and photo interpretation concepts as a means of acquiring reliable data for engineering and management planning. Potentials, limitations, instrumentation and unique requirements are considered. Fall and Spring, 1980-81.
Prerequisites: ERE 306/308 (or ERE 371 concurrent) or equivalent.

585. Microscopy and Photomicrography (3)
Two hours of lecture, one hour of demonstration, and three to five hours of laboratory. Principles of light microscopy and photomicrography with extensive laboratory practice. Introduction to scanning and transmission electron microscopy. Fall, 1980.
Prerequisite: Permission of the instructor.

596. Special Topics (1-3)
Lectures, conferences, discussions, and laboratory. Topics in environmental and resource engineering not covered in established courses. Designed for the beginning graduate student or selected upper division undergraduate. Fall and/or Spring, 1980-81.

611. Energy: Production and Conservation (3)
Three hours of lecture. An introductory graduate level course dealing with the forms and impacts of energy production and conservation. A review of basic mechanics and thermodynamics as related to heat and energy conversion fundamentals for a variety of fuel and energy resources, with special attention to biomass conversion focus on the residential/commercial sector. Field trips and student reports are required. Fall or Spring, 1980-81.

640. Water Resource Systems (3)
Three hours of lecture and discussion. Fundamentals of the systems approach to complex water resource problems. Characteristics of water resource systems, related to systems engineering methodologies. Quantitative and qualitative subsystems are considered in a

technical nature which exposes the socio-legal-political interfaces of water resource decisionmaking. Spring, 1981.
Prerequisite: FEG 340 or equivalent.

643. Water Pollution Engineering (3)
Two hours of lecture and three hours of laboratory. Introduction to the physical, chemical, and biological parameters of waste water treatment processes and to the principles of the unit operations involved. Study of the design parameters and design procedures of waste water treatment systems. Spring, 1981.
Prerequisites: Physics and CHE 356 or permission of the instructor.
Note: A student may not enroll in or receive credit for both ERE 440 and ERE 643.

652. Remote Sensing Interpretation (3)
Two hours of lecture and three hours of laboratory. Introduction with a qualitative emphasis on the fundamentals of acquiring, analyzing, and utilizing remote sensing data in the performance of natural resource inventories, environmental quality surveys, site development studies and land use analyses. Oriented for multidisciplinary participation. Fall and/or Spring, 1980-81.
Prerequisites: Physics and calculus or permission of the instructor.
Note: Not open to students having previous credit for FEG 352.

655. Remote Sensing Measurements (3)
One hour of lecture, one hour of discussion and three hours of laboratory comprising an indepth coverage of the theory, design, and application of remote sensing systems and techniques employed to obtain precise spectroradiometric measurements in vegetation surveys, site engineering, data acquisition endeavors and environmental monitoring efforts. Photographic and nonphotographic systems are considered. A variety of field and laboratory measurement endeavors employing precision remote sensing equipment is included. Fall or Spring, 1980-81.
Prerequisites: FEG 352 or ERE 652, and FEG 363 or ERE 563 or permission of the instructor.

658. Geometric Geodesy (3)
An introductory graduate level course for those without previous background in theoretical geodesy. Topics covered include position determination for short and long lines on the ellipsoid, the ellipsoidal triangle, the parametric equations, three-dimensional geodesy, and mappings of the ellipsoid. Fall, 1980.
Prerequisite: Permission of the instructor.

659. Astronomic and Gravimetric Geodesy (3)
An introductory graduate level course in geodetic astronomy and the gravity field of the earth. Topics covered include updating star positions; precise time keeping; position determination by natural and artificial satellites; the fundamental concepts of gravimetric geodesy, including the potential function; attraction; undulations of the geoid and deflections of the vertical. Fall, 1980.
Prerequisite: ERE 658.

660. Theory of Errors and Adjustments (3)
The theory of errors and adjustments, of observations oriented toward geodesy and photogrammetry. Topics include error definitions, weighted observations, method of least squares, matrix algebra in adjustments, variance-covariance matrix, the error ellipse and the general case of adjustment. Fall or Spring, 1980-81.
Prerequisites: Calculus and a beginning course in statistics.

664. Photogrammetry II (3)
Mathematical theory of photogrammetry including space resection, orientation, and intersection. The theory and use of photogrammetric analog computers in providing resource engineering maps. Fall, 1980.
Prerequisite: ERE 563 or equivalent.

670. Principles of Pulping and Bleaching **(3)**
Two hours of lecture and three hours of laboratory plus literature study of assigned topics, independent project planning and/or laboratory study. Discussion of pulping and bleaching processes. Effects of chemical and physical variables on the wood components and pulp properties; chemistry involved. Experiments in pulping and bleaching and pulp evaluation. Fall, 1980.
Prerequisites: Organic, physical, and analytic chemistry.
Note: A student may not enroll in or receive credit for both PSE 461 and ERE 670.

671. Chemistry of Pulping and Bleaching **(3)**
Three hours of lecture. Discussion of the chemistry underlying the commercial pulping and bleaching processes, designed to assist in interpreting the phenomena observed in these operations. Emphasis is placed on those reactions which contribute to delignification and the removal of chromophoric groups in lignin and extractives. Spring, 1981.
Prerequisite: FCH 572 or permission of the instructor.

672. Selected Topics in Colloid and Surface Science **(3)**
Three hours of lecture, discussions, and problem solving. The following topics will be covered: 1) viscosity of dilute dispersions, 2) osmotic and equilibrium, 3) light scattering, and 4) surface tension. Fall, 1980.
Prerequisites: Two semesters of Physical Chemistry and permission of instructor.

673. Selected Topics in Colloid and Surface Science **(3)**
Three hours of lecture, discussions, and problem solving. The following topics will be covered: 1) adsorption from solution and at Gas-Solid interface, 2) electrical double layer, 3) Van der Waals attraction and flocculation, and 4) electrophoresis, zeta potential, and electro-osmosis. Fall, 1980.
Prerequisites: Two semesters of Physical Chemistry and permission of instructor.

675. Principles of Unit Operations **(4)**
Three hours of lecture and discussion and one two-hour computation period. Fundamentals of fluid dynamics, heat and mass transfer, appropriate analogies and process applications. Stage operations and computation methods. Application to distillation, extraction, gas absorption, evaporation, crystallization and drying. Design, operation, and computer simulation of equipment. Fall, 1980.
Prerequisites: Calculus and physical chemistry or permission of the instructor.

677. Paper Properties **(4)**
Three hours of lecture, three hours of laboratory, and discussion plus evaluation of literature, independent project planning and/or laboratory study. Evaluation and study of the physical, optical, and chemical properties of paper and the interrelationships existing between paper manufacturing methods, papermaking additives, test results and the ultimate properties desired in the finished paper. Fall, 1980.
Prerequisite: Permission of the instructor.
Note: A student may not enroll in or receive credit for both PSE 465 and ERE 677.

678. Paper Coating and Converting **(3)**
Two hours of lecture and three hours of laboratory plus evaluation of literature, independent project planning, and/or laboratory study. Evaluation and study of the various coating materials and processes used by the paper industry. Introduction to polymers and their use in converting operations. Study of materials and equipment used in converting operations, fundamentals and parameters which control their use, effects on final properties of papers. Spring, 1981.
Prerequisite: PSE 465 or permission of the instructor.
Note: A student may not enroll in or receive credit for both PSE 466 and ERE 678.

680. The Anatomy and Ultrastructure of Wood **(2)**
Two hours of lecture and/or demonstration and discussion. The gross, microscopic and submicroscopic structure of wood including organization of the cell wall, distribution of chemical constituents and abnormalities in wood. Fall, 1980.

682. Transport Processes **(3)**
Two hours of lecture and three hours of laboratory. The relationship between wood structure and wood permeability, moisture movement, and heat transfer. Fire retardant and wood preservation treatments. Wood drying. Unsteady-state transport processes. An advanced laboratory problem with report in wood-moisture relationships, wood drying, the relationship between wood permeability and treatability, or wood preservative treatments. Spring, 1981.
Prerequisite: Permission of the instructor.

683. Structure and Properties of Engineering Materials **(3)**
Three hours of lecture and discussions. Study of the mechanical, thermal, electronic, and magnetic behavior of metals, ceramics, polymers, and composite materials relating internal structure and engineering properties. "Internal structure" may range from subatomic, atomic, and molecular levels through the structure of crystals and amorphous solids up to the macro structure of multiphase and composite materials. Spring, 1981.
Prerequisite: Permission of instructor.

684. Mechanical Properties of Wood **(3)**
Two hours of lecture and three hours of laboratory. The effect of the anatomical and chemical nature of wood on its response to static and dynamic force systems. The theory of elasticity as applied to wood. Fall or Spring, 1980-81.
Prerequisite: Permission of the instructor.

685. Applied Electron Microscopy **(5)**
Two hours of lecture, two hours of laboratory/demonstration, minimum of 10 hours of individual laboratory. The theory and operation of the transmission electron microscope including specimen preparation, photographic technique and interpretation of micrographs. Fall, 1980.
Prerequisite: Consultation with the instructor.

686. Wood-Water Relationships **(3)**
Two hours of lecture and three hours of laboratory. Relationship between wood moisture content and its environment, electrical properties, theories of moisture sorption, hygroscopic swelling and shrinking, thermodynamics of moisture sorption, mechanism of moisture movement. Fall, 1980.
Prerequisite: Permission of the instructor.

688. Tropical Timbers in Commerce **(2)**
Two hours of lecture. Introduction to the commercial use of tropical timbers; the factors of forest conditions, stand types and wood qualities influencing their utilization and the development of trade. Sources of information. Spring, 1981.
Prerequisite: Permission of the instructor.

689. Tropical Wood Anatomy **(1)**
Anatomical characters, identification and taxonomy of tropical woods important in commerce. Spring, 1981.
Prerequisite: WPE 386 or 387. Recommended that ERE 688 be taken concurrently or previously.

691. Air Pollution Engineering **(3)**
Three hours of lecture and discussion. Study of the chemical, physical, and meteorological principles of air pollution and its control. Local and global effects of air pollution. The atmospheric survey. Examination of the operating principles and design parameters of the various air pollution control systems. Air quality and emission standards, Spring, 1981.
Prerequisites: Physics and CHE 356 or permission of the instructor.
Note: A student may not enroll in or receive credit for both ERE 441 and ERE 691.

760. Analytical Photogrammetry I **(3)**
Two hours of lecture and three hours of laboratory. Mathematical theory of photogrammetry including space resection, orientation, intersection and aerial triangulation. Fall or Spring, 1980-81.
Prerequisites: FEG 363 and APM 360 or equivalent.

762. Instrumental Photogrammetry I (3)
Two hours of lecture and three hours of laboratory. The theory and practice of extracting information from photographs with the aid of photogrammetric plotters. Fall or Spring, 1980-81.
Prerequisite: FEG 363 or equivalent.

775. Applied Thermodynamics (3)
The study and application of thermodynamics, including the first and second law, phase relationships, thermochemistry, the production of work and equilibrium relationships. Fall or Spring, 1980-81.
Prerequisites: CHE 346, CHE 356, or equivalent.

785. Scanning Electron Microscopy (3)
Two hours of lecture, demonstration and laboratory. Six hours of independent laboratory experience per week. the theory and operation of the scanning electron microscope including specimen preparation, photographic technique, and interpretation of micrographs. Spring, 1981.
Prerequisite: Permission of the instructor.

796. Advanced Topics (1-3)
Lectures, conferences, discussions, and laboratory. Advanced topics in Forest Engineering, Paper Science and Engineering, and Wood Products Engineering. Fall and/or Spring, 1980-81.
Prerequisite: Permission of the instructor.

797. Seminar (1-3)
I. Forest Engineering topics. II. Paper Science and Engineering topics. III. Wood Products Engineering topics. Fall and Spring, 1980-81.

798. Research in Environmental and Resource Engineering (Credit hours to be arranged)
I. Independent research topics in Forest Engineering. II. Independent research topics in Paper Science and Engineering. III. Independent research topics in Wood Products Engineering. Fall and Spring, 1980-81.

880. Interpretation of Cellular Ultrastructure (2)
One hour of lecture and two hours of demonstration and discussion. The organization and sculpturing of the walls of plant cells; the cellulose microfibril, matrix and incrusting substances, and the warty layer. The ultrastructure and function of cytoplastic organelles in cells. The nucleus, the mitochondrion, the chloroplast, the endoplasmic reticulum, microtubules, the gap junction and the tight junction. The tools and techniques used for light and electron microscopic study of cells, and the interpretation of structural evidence. Directed study and discussion of the latest (current) literature on pertinent topics. Spring, 1981.
Prerequisite: Permission of the instructor.

899. Master's Thesis Research (Credit hours to be arranged)
Research and independent study for the master's degree and thesis. Fall and Spring, 1980-81.

999. Doctoral Thesis Research (Credit hours to be arranged)
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1980-81.

EST—ENVIRONMENTAL STUDIES

100. Introduction to Environmental Studies (3)
Lecture and discussion on the nature of man, his social, cultural, economic and political institutions and how these condition his views of the environment. Fall, 1980.

498. Undergraduate Problem **(1-3)**
Interdisciplinary research designed to solve environmental problems. Selection of subject matter to be determined by students in conference with the Undergraduate Environmental Studies Advisory Group. Problem analysis and programs for solution in the form of a final report required. Fall and/or Spring, 1980-81.
Prerequisite: Consent of instructor.

FBL—BIOLOGY (FOREST BIOLOGY)

303. Introductory Environmental Microbiology **(3)**
Two hours of lecture and three hours of laboratory. An introduction to the biology of microorganisms and viruses and a study of their interactions with other microbes and macroorganisms. Fall, 1980.
Prerequisite: A year course in biology or equivalent.

320. General Ecology **(3)**
Two hours of lecture, three hours of field trips during the first half of the semester. Three hours of lecture during the second half of the semester. Introduction to ecosystem ecology stressing the dynamic interrelationships of plant and animal communities with their environments, ecological factors, energy flow and trophic levels in natural communities, plant responses and animal behavior, population dynamics, biogeography, and representative ecosystems. The ecological impact of man is reviewed. Spring, 1981.
Prerequisite: A year course in biology or equivalent.

330. Principles of General Physiology **(3)**
Three hours of lecture. Introduction to the dynamics of living systems with emphasis on the universality of the biological world. Spring, 1981.
Prerequisite: One semester of organic chemistry.

400. Forest Techniques for Biologists **(1)**
Full-time for one week. Cranberry Lake Biological Station. Techniques of forest stand inventory and measurements; mensurational analysis; stand manipulation, harvesting, regeneration, and protection. Summer, 1981.

405. History of Natural Science **(1)**
One hour of lecture. A review of the history of western science from pre-Ionian times to Darwin, with evaluation of the impact of culture and religion on scientific progress. Spring, 1981.

420. Field Experience—Internship **(5)**
Full-time for at least five weeks, or equivalent, of employment with an agency or professional involved in field activity. A resident faculty member is required to serve as course evaluator. Approval of curriculum director is necessary. See advisor for detailed procedural information. Summer, 1981.

421. Ecology of Freshwaters **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. Experimental and observational studies of environmental and biotic interactions influencing productivity of freshwaters. Basic concepts at the organismic, population, and community level. Summer, 1981.

430. Fungal Physiology **(3)**
Three hours of lecture and discussion. Principles of growth, morphogenesis, and reproduction of the fungi emphasizing the role of the environment in controlling fungal processes. Spring, 1981.
Prerequisite: FBL 330 or equivalent.

431. Fungal Physiology Laboratory **(1)**
Three hours of laboratory. Selected experiments in the quantitative study of fungal growth, nutrition, sporulation, and spore germination. Spring, 1981.
Co-requisite: FBL 430.

432. Physiological Ecology of Plants **(3)**
Three hours of lecture. Examination of the interactions between plants and their environment. Emphasis will be given to the physiology of plants as it is modified by fluctuating external conditions and the mechanisms of plant adaptation. Students completing FBO 432 should not enroll in FBO 330. Spring, 1981.
Prerequisites: Introductory courses in physics, FBO 300, or permission of the instructor.

470. Principles of Genetics **(3)**
Three hours of lecture and discussion. A general course covering concepts of genetics and evolution base to upper division biology and biochemistry courses. Includes the inheritance and analysis of Mendelian and quantitative traits, the chemical nature of the gene and its action, the genetic structure of populations and their evolution. Numerical methods for characterizing and analyzing genetic data are introduced. Spring, 1981.
Prerequisite: A one-year college introductory biology course.

471. Principles of Genetics Laboratory **(1)**
Three hours of autotutorial laboratory. Experiments with plants and animals and computer simulation exercises demonstrate the basic principles of inheritance of Mendelian and quantitative traits and changes in populations caused by major forces in evolution or by breeding procedures. Numerical methods for characterizing quantitative traits and for testing hypotheses are introduced. Spring, 1981.
Co-requisite: FBL 470 or equivalent.

472. Introduction to Quantitative and Population Genetics **(1)**
Ten lecture-discussions and four autotutorial laboratories the second half of the semester (incl. Lecture-Lab Modules 5 and 6 of FBL 470 and 471). Basic genetic concepts of quantitative inheritance, the structure of populations and evolution. Laboratory experiments and computer simulations are used to demonstrate these concepts. Numerical methods for characterizing and analyzing genetic data are introduced. Spring, 1981.
Prerequisite: An introductory genetic lecture-laboratory course deficient in these areas of genetics and permission of instructor.

496. Topics in Biology **(1-3)**
Experimental, interdisciplinary, or special coursework in biology for undergraduate students. Subject matter and method of presentation varies from semester to semester. May be repeated for additional credit. Fall or Spring, 1980-81.

497. Undergraduate Seminar **(1)**
Literature surveys and seminars on topics of biological interest and importance. Subject to be generated by faculty and students and to be announced prior to registration. Fall and Spring, 1980-81.

498. Research Problem in Biology **(1-3)**
Independent research in topics in Forest Biology for the superior undergraduate student. Selection of subject area determined by the student in conference with appropriate faculty member. Tutorial conferences, discussions and critiques scheduled as necessary. Final written report required for departmental record. Fall, Summer and/or Spring, 1980-81.
Prerequisite: Permission of instructor.

500. Forest Biology Field Trip **(2)**
A seven-to ten-day trip to (1) agencies engaged in biological research, management, and administration, or (2) regions or areas of unusual biological interest. A final report is required. Estimated student expense, $75. Fall or Spring, 1980-81.
Prerequisite: Permission of the instructor.

522. Populations Ecology **(3)**
Two hours of lecture and three hours of laboratory. Description, analysis, evolution, interactions and stability of natural and experimental populations. Spring, 1981.
Prerequisite: FBL 320 or equivalent.

525. Limnology **(3)**
Three hours of lecture. An introduction to the physics, chemistry, and biology of inland waters, with particular emphasis on lakes. The course focuses on lakes as integrated ecosystems, and analyzes perturbations in this environment on the structure and function of the biological communities contained therein. Fall, 1980.
Prerequisites: An introductory course in physics, chemistry, and ecology.

526. Limnology Laboratory **(1)**
One laboratory or field trip. An introduction to limnology techniques and the procedures for empirically analyzing ecological relations in aquatic ecosystems. Field trips to local aquatic habitats. FBL 525 must be taken concurrently or previously. Fall, 1980.

540. Chemical Ecology **(3)**
Two hours of lecture and one hour of discussion. A treatment of biological phenomena incorporating elements of ecology, physiology, and chemistry as a basis for development, behavior, and survival. Emphasis is on the intra- and inter-specific relationships involving chemical messengers at the organismal, population, and community levels. Spring, 1981.
Prerequisites: Organic chemistry, general ecology, general physiology.
Note: FBL 540 is also listed as FCH 540.

635. Membranes and Biological Transport **(3)**
Two hours of lecture and one hour of discussion. Composition, structure, and physical properties of membranes. Membrane functions including transport, bioelectricity, and cell compartmentalization. Specific transport processes in biological systems. Fall, 1980.
Prerequisites: One semester of biochemistry and an advanced physiology course, or permission of the instructor.

796. Topics in Biology **(1-3)**
A course offered by the faculty for students interested in biology. Check the Schedule of Courses for details. Fall and Spring, 1980-81.

997. Biology Seminar **(1)**
One hour of lecture and discussion per week. The course emphasizes current concepts and developments in biology. Fall and/or Spring, 1980-81.

FBO—BOTANY (FOREST BOTANY AND PATHOLOGY)

300. Structure and Function of Plants **(3)**
Two hours of lecture and three hours of laboratory in the Autotutorial Learning Center. An introduction to plant biology with special emphasis on the structure and functions of the green plant. Fall, 1980.
Prerequisite: A year course in biology or equivalent.

310. Classification of the Plant Kingdom **(3)**
Two hours of lecture and three hours of laboratory. Introductory study of the plant kingdom with emphasis on the angiosperms. Spring, 1981.

315. Dendrology I **(3)**
Two hours of lecture and one three-hour laboratory/field trip. Field study, identification, natural history, and elementary silvics of important forest trees of North America. Fall, 1980.

330. Plant Nutrition **(3)**
Three hours of lecture. Descriptive aspects of the fundamental activities of plants. Subjects to be covered include cell structure, water and mineral metabolism, organic nutrition, and a brief introduction to biological control mechanisms. Will not satisfy the plant physiology requirement of botany majors. Fall, 1980.
Prerequisite: FBO 300 or equivalent.

360. Forest and Shade Tree Pathology (3)
Two hours of lecture and three hours of autotutorial laboratory. Major diseases of forest, shade, and ornamental trees and deterioration of forest products will be discussed with emphasis on disease identification, principles of disease development, effects of disease on the host and practical control measure. Spring, 1981.

415. Dendrology II (1)
One three-hour field trip/laboratory. A continuation of Dendrology I emphasizing trees and shrubs ecologically important in the Central New York region and economically important in North America. Fall, 1980.

417. Adirondack Flora (2)
Half-time for four weeks. Cranberry Lake Biological Station. Field study of the summer flora of the Adirondack Mountains. Summer, 1981.

422. Ecology of Forest Communities (2)
Half-time for four weeks. Cranberry Lake Biological Station. Study of the structural and functional characteristics of selected Adirondack forest ecosystems; techniques of vegetational analysis. Special requirement: students must be prepared to go on one over-night camping trip to an isolated study area. Summer, 1981.

425. Plant Ecology (3)
Two hours of lecture and discussion and one laboratory session. A first course in plant community ecology dealing with the dynamics of community development and change and the process of community analysis and description. Fall, 1980.
Prerequisite: FBL 320.

427. Bryoecology (3)
Two hours of lecture and one three-hour laboratory or field trip. A study of the taxonomic diversity and ecological adaptations of Bryophytes in regional ecosystem. Spring, 1981.

428. Wetland Plant Ecology (1-2)
Full-time for one week. Cranberry Lake Biological Station. Study of wetland plant community dynamics and environmental relationships in the Adirondack Mountain Region. Summer, 1981.

432. Physiological Ecology of Plants (3)
Three hours of lecture. Examination of the interactions between plants and their environment. Emphasis will be given to the physiology of plants as it is modified by fluctuating external conditions and the mechanisms of plant adaptation. Students completing FBO 432 should not enroll in FBO 330. Spring, 1981.
Prerequisites: Introductory courses in physics, FBO 300, FBL 320, or permission of the instructor.

460. Field Problems in Forest Pathology (1)
Full-time for one week. Cranberry Lake Biological Station. Field study of important tree diseases in the Adirondacks, including heart-rots, root-rots, cankers, rusts, foliage diseases, mistletoe, and physiological diseases. Also field study of mycorrhizae and other tree-root mutualisms. Summer, 1981.

461. Principles of Forest Pathology (3)
Three hours of lecture, discussion or laboratory. Concepts and principles of tree diseases in relation to forest practices and practical experience in disease diagnosis and impact evaluation. Fall, 1980.
Prerequisite: FBO 360 or permission of the instructor.

465. Field Mycology (2)
Half-time for four weeks. Cranberry Lake Biological Station. An introduction to the collection and identification of the Adirondack fungal flora. Field techniques and laboratory identification of the major fungi found in selected ecosystems. Summer, 1981.

490. Plant Propagation **(1)**
One combined lecture-demonstration-laboratory plus supervised greenhouse assignments. Instruction in principles and practices of plant propagation and in related greenhouse operations. Fall and Spring, 1980-81.
Prerequisite: Senior status in biology curriculum.

510. Mycology **(5)**
Three hours of lecture and six hours of laboratory. Fundamentals of the morphology, taxonomy, cytology, life histories, and ecology of fungi. Laboratory experience in culturing and identifying fungi. Fall, 1980.
Prerequisite: FBO 310 or FBO 360.

515. Systematic Botany **(3)**
Two hours of lecture and three hours of laboratory. Identification, nomenclature, and classification of flowering plants with special emphasis on local flora and on developing the ability to classify the plants of any region. Fall, 1980.
Prerequisites: FBO 300, FBO 310 or permission of the instructor.

530. Plant Physiology **(3)**
Two hours of lecture. Internal processes and conditions in higher plants with emphasis on physiological and biochemical concepts. For students majoring in the biological sciences. Spring, 1981.
Prerequisites: FBO 300, FBL 330, or permission of the instructor.
Note: Botany majors electing this course for their concentration must also take FBO 531.

531. Plant Physiology Laboratory **(2)**
Two laboratory sessions. Introduction to current methods and procedures of physiological research including nutrition, tissue culture, photosynthesis, respiration, and hormonal regulation of growth. Spring, 1981.
Prerequisites: FBL 330, co-requisite FBO 530, or permission of the instructor.

562. Wood Microbiology **(3)**
Two hours of lecture and three hours of laboratory/field trip. Major types of fungus defects of wood and its products and principles of control. Special emphasis on chemistry of wood decay, wood durability, toxicants, lumber discolorations, heart-rots and decay in forest products. Fall, 1980.
Prerequisites: Organic chemistry, FBO 360, or permission of the instructor.

585. Plant Anatomy **(3)**
Two hours of lecture and three hours of laboratory. An introductory course in plant anatomy designed to familiarize the student with the organization and development of the primary and secondary plant body of higher plants. Spring, 1981.
Prerequisite: FBO 300.

625. Plant Ecology **(3)**
Two hours of lecture and discussion and one laboratory/discussion. A first course in plant community ecology for beginning graduate students focusing on dynamics of community development and change and the processes of community analysis and description. Fall, 1980.
Prerequisite: FZO 320, or equivalent.

630. Fungus Physiology **(3)**
Two hours of lecture and one hour of discussion. Principles of growth, reproduction, and differentiation of the fungi emphasizing the role of the environment in controlling fungal processes. Spring, 1981.
Prerequisite: Two semesters of physiology or biochemistry.

636. Photosynthesis **(3)**
Two hours of lecture and one hour of discussion. Advanced study of photosynthesis on the cellular and organismal level. Specific topics will reflect basic concepts and current emphasis in this field. Fall (odd years), 1981.
Prerequisite: Two semesters of physiology or a course in biochemistry.

660. Phytopathology (3)
Two hours of lecture and discussion and three hours of autotutorial laboratory. Principles and concepts of plant pathology. Major diseases of ornamental plants, vegetable crops, fruit crops, field crops, and trees. This is an introductory plant pathology course for graduate students in all departments. Spring, 1981.

661. Principles of Forest Pathology (3)
Four hours of lecture, discussion, and laboratory. Concepts and principles of tree diseases in relation to forest practices and practical experience in disease diagnosis and impact evaluation. Fall, 1980.
Prerequisite: FBO 360, 660, or permission of the instructor.

665. Principles and Practices of Tree Disease Control (3)
Two hours of lecture and three hours of laboratory or discussion. An advanced course considering the major chemical, cultural, and biological practices and integrated disease management strategies for tree disease control. Spring, 1981.
Prerequisites: FBO 510, 461, or permission of the instructor.

725. Topics in Plant Ecology (2)
Two hours of seminar and discussion. An advanced course dealing with current research in plant community dynamics. May be repeated for additional credit. Fall, 1980.
Prerequisite: FBO 425 or 625 or permission of the instructor.

733. Techniques in Plant Physiology (2-4)
Comprehensive study of techniques essential for research in plant physiology. Students may choose the instructors they wish to work with, and should consult the instructors for further details. May be repeated for credit in different specialties. Fall, 1980.
Prerequisites: FBO 530 and 531 or an equivalent physiology course, biochemistry with laboratory, or permission of the instructor.

761. Topics in Phytopathology (3)
Two two-hour lectures and discussions. Discussions of specific subjects in phytopathology and wood microbiology. Topic selection is based on availability of expertise and will be announced in advance.This course may be repeated for credit in different specialties. Fall or Spring, 1980-81.

763. Mycorrhizae (3)
Two hours of lecture and three hours of laboratory/discussion. A basic background course covering structural, functional, and ecological aspects of mycorrhizae; their methods of field and laboratory study; and applications in forestry practice. Fall (odd years), 1981.

797. Botany Seminar (1)
Seminar discussions of subjects of interest and importance to the biology of plants. Fall and Spring, 1980-81.

798. Research in Forest Botany (Credit hours arranged according to nature of problem)
Advanced study in research problems in forest pathology, wood deterioration, tree physiology, anatomy, mycology, ecology, taxonomy, and genetics. Typewritten report required. Fall and Spring, 1980-81.

810. Advanced Mycology, Homobasidiomycetes (3)
Review of selected literature as well as laboratory training in identification and research techniques. Fall, 1980.
Prerequisite: FBO 510.

811. Advanced Mycology, Heterobasidiomycetes (3)
Review of selected literature as well as laboratory training in identification and research techniques. Spring (even years), 1982.
Prerequisite: FBO 510.

812. Advanced Mycology, Ascomycetes **(3)**
Review of selected literature as well as laboratory training in identification and research techniques. Fall (even years), 1980.
Prerequisite: FBO 510.

813. Advanced Mycology, Myxomycetes, Phycomycetes, Fungi Imperfecti **(3)**
Review of selected literature as well as laboratory training in identification and research techniques. Spring (odd years), 1981.
Prerequisite: FBO 510.

830. Physiology of Growth and Development **(2)**
Lecture. A study of the growth and development of plants and the physiological and biochemical processes that influence the development of form and structure in higher plants. Fall (even years), 1980.
Prerequisites: FBO 530, 585, and organic chemistry or permission of the instructor.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1980-81.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1980-81.

FCH—CHEMISTRY

222. Organic Chemistry Laboratory I **(1)**
One three-hour laboratory. Laboratory techniques in organic chemistry. Melting points, distillation, recrystallization, extraction, column and thin layer chromatography, natural product isolation. Qualitative functional group analysis. Fall, 1980.

223. Organic Chemistry II **(3)**
Two hours of lecture, one hour of recitation. A study in depth of the reactivity characteristics of the various classes of carbon compounds. The relation of chemical reactivity and physical properties to electronic and three-dimensional characteristics of carbon compounds. Spring, 1981.
Prerequisite: One semester of organic chemistry.

224. Organic Chemistry Laboratory II **(1)**
One three-hour laboratory. Continuation of FCH 222. Simple physical, quantitative, and instrumental techniques applied to organic chemistry. Gas chromatography, polarimetry, kinetics. Introduction to synthesis. Spring, 1981.
Prerequisite: FCH 222 or equivalent.
Co-requisite: FCH 223 or equivalent.

225. Organic Chemistry I **(3)**
Two hours of lecture, one hour of recitation. A survey of representative classes of carbon compounds with emphasis on structure, fundamental reactivity, and other important properties and characteristics relevant to biological systems. Nonchemistry majors. Fall, 1980.

226. Organic Chemistry II **(3)**
Three hours of lecture and discussion. The structure and reactivity of organic compounds, utilizing natural products as examples, will be studied in order to develop an organic chemical background for further study of biological chemistry. Nonchemistry majors. Spring, 1981.
Prerequisite: FCH 225 or equivalent.

325. Organic Chemistry III **(4)**
Two hours of lecture, one six-hour laboratory. Classical and recent literature synthesis or organic compounds, employing advanced techniques. Fall, 1980.
Prerequisite: Two semesters of elementary organic chemistry.

360. Physical Chemistry **(3)**
Three hours of lecture. Includes discussion on the properties of gases and liquids, laws of thermodynamics, solutions and colligative properties, and electrochemical cells. Fall, 1980.
Prerequisites: One year of college physics, differential and integral calculus.

361. Physical Chemistry **(3)**
Three hours of lecture. Includes discussion on the structure of matter, principles of quantum mechanics, spectroscopy, and chemical kinetics. Spring, 1981.
Prerequisite: Physical Chemistry FCH 360 or the equivalent.

380. Instrumental Methods of Analysis **(3)**
Two hours of lecture and one three-hour laboratory. Lecture includes theory, applicability, and limitations of a number of current methods of instrumental analysis. Laboratory sessions provide practice with several of these techniques. Spring, 1981.
Prerequisites: General chemistry and quantitative analysis.

384. Spectrometric Identification of Organic Compounds **(1-2)**
Two hours of lecture and discussion. The first half semester (1 credit) will deal with common classes of organic compounds; the second half semester (1 credit) will deal with more complex structures. The use of complementary information from mass, infrared, nuclear magnetic resonance, and ultraviolet spectrometry will be applied to identification of organic natural products. Spring, 1981.
Prerequisites: Organic chemistry; one semester of advanced organic chemistry for second credit.

410. Topics in the Chemistry of Pollution **(1-3)**
Three hours of lecture. Discussion of some specific areas of current concern to the environmental chemist. Lectures by staff members supplemented by outside speakers from industry and governmental agencies. This course is taught in modules. Spring, 1981.
Prerequisites: Organic chemistry and permission of the instructor.

495. Introduction to Professional Chemistry **(1)**
The professional chemist and his relationships with industry, government, and universities. Employment opportunities for the chemist, professional organizations, and unions will be discussed. The selection of a senior research topic and a literature survey will be required. Fall, 1980.
Prerequisite: Senior status.

496. Special Problems in Chemistry **(1-3)**
An opportunity for a special problem, technique development, independent or unstructured study in an area related to the chemical profession. The work may be technical, professional, or interdisciplinary. Advisors outside this department may be solicited. A brief proposal must be presented for approval with specific arrangements outlined including faculty advisor and objectives of the study. Evidence of competence and appropriate effort is required for credit. A written report will be expected. Fall and Spring, 1980-81.
Prerequisite: Upper division status.

497. Undergraduate Seminar **(1)**
One hour per week. Literature surveys and seminars on topics of current research interest and recent advances in chemistry. Spring, 1981.

498. Introduction to Research **(5)**
Eighteen hours of laboratory, library search and report writing. Solution of a selected research problem using special laboratory techniques. Typewritten report on data, procedures, results, and conclusions. Spring, 1981.

510. Aquatic Environmental Chemistry **(3)**
Three hours of lecture. Includes discussion of structure of water, its physical and biological chemistry, water treatment problems, nutrient cycles, trace organic pollutants, and the environmental chemistry of air/water and sediment/water interfaces. Fall, 1980.

520. Nuclear and Radiation Chemistry **(2)**

The two one-hour lectures will cover the information required for the basic understanding of nuclear reactions, the types of radiation emitted, the instrumentation necessary to detect and measure this radiation, the principles of radioisotope tracer techniques, and radiation chemistry which is the effect of radiation on organic systems. Visits to the Cornell Reactor and the Nuclear Medicine Department of the Upstate Medical Center will be arranged. Spring, 1981.

Prerequisites: Physical, organic and inorganic chemistry or by permission of the instructor.

Note: This course can be taken independently of FCH 521.

521. Nuclear Chemical Techniques **(1)**

The laboratory will consist of one four-hour laboratory class every two weeks, with one hour to be made up at the student's discretion to accommodate counting periods which extend over several weeks. A short movie by the AEC each week will be required for the sixth hour. The laboratory will give each student the opportunity to use the individual counting instruments, gain experience in the handling and preparation of radioactive samples and the use of the 1000-curie-cobalt source in radiation chemistry. Spring, 1981.

Prerequisites: Physical, organic, and inorganic chemistry or permission of the instructor. Advanced tentative registration is required.

Co-requisite: FCH 520.

530. Biochemistry I **(3)**

Three hours of lecture. General biochemistry with emphasis on cellular constituents and metabolic reactions. The chemical, physical, and biological properties of amino acids, proteins, carbohydrates and their intermediary metabolism will be discussed. The chemistry of enzymes, energy transfers, and biological oxidations will also be covered. Fall, 1980.

Prerequisites: One year of organic chemistry and one year of physical chemistry.

531. Biochemistry Laboratory **(2)**

Six hours of laboratory. This course will stress techniques used in biochemical research. Techniques used include various types of chromatography, electrophoresis, and spectrophotometry and methods involved in the isolation, purification, and assay of enzymes. Fall, 1980.

Prerequisite: One semester of quantitative analysis with laboratory.

532. Biochemistry II **(3)**

Three hours of lecture. Topics discussed are: application of tracer techniques to biochemistry, the chemical and biochemical properties of lipids, theories on the origin of life, photosynthesis and the biosynthesis of steroids and terpenes, plant aromatics, amino acids, porphyrins and other aspects of nitrogen metabolism. Spring, 1981.

Prerequisites: FCH 530 and its prerequisites.

539. Principles of Biological Chemistry **(3)**

Three hours of biochemistry with emphasis on their relationship to biology. Topics include basic metabolic pathways, structure, and function of proteins, enzymes, and nucleic acids, energy relationships and biochemical control mechanisms. Nonchemistry majors. Fall, 1980.

Prerequisite: A two-semester course in organic chemistry is desirable, but a one-semester course is acceptable.

540. Chemical Ecology

This course is the same as FBL 540. Refer to description on page 140.

550. Introduction to Polymer Science I: Polymer Synthesis and Mechanisms **(3)**

Three hours of lecture. Introduction to the synthesis of polymers and the mechanism of polymerization processes. Addition homopolymerization and copolymerization by radical, ionic and coordination type catalysts. Synthesis of block and graft copolymers. Stepwise polymerization, network formation and gelation. Structure of polymers and stereoregular polymerization. Degradation of polymers, reaction on polymers, polyelectrolytes. Fall, 1980.

Prerequisites: One year of organic chemistry and one year of physical chemistry.

551. Polymer Techniques (2)
One hour of lecture and discussion and three hours of laboratory; lab reports. Techniques of polymer preparation: free radical solution and emulsion polymerization, gel permeation. Molecular weight determination by light scattering, osmometry, viscosity, gel chromatography. Structure characterization by X-ray diffraction, electron microscopy, nuclear magnetic polarized microscopy, stress-strain and swelling equilibrium and thermal analysis. Fall, 1980.
Prerequisites: One year of organic and one year of physical chemistry.

552. Introduction to Polymer Science II: Polymer Properties and Technology (3)
Three hours of lecture. Introduction to the physical chemistry, physics, processing and technology of synthetic polymers. Polymer solutions, including molecular weight determinations and chain statistics. Polymer solid states, including rubber elasticity, viscoelasticity, the glassy state and the crystalline state. Properties, processing and technology of films, fibers, elastomers and foams. Spring, 1981.
Prerequisites: One year of organic chemistry and one year of physical chemistry.

571. Wood Chemistry I: General Wood Chemistry (2)
Two hours of lectures. Introduction to carbohydrate chemistry. Chemistry of cellulose, hemicelluloses, and lignin. Cellulose derivatives. Distribution of polysaccharides and lignin in wood. Wood extractives. Chemistry of bark. Formation of heartwood. Wood as a chemical raw material. Fall, 1980.
Prerequisite: One or two semesters of a three credit undergraduate course in organic chemistry.

572. Wood Chemistry II: Wood and Pulping Chemistry (3)
Three hours of lectures. Introduction to carbohydrate chemistry. Chemistry of cellulose, hemicelluloses, and lignin. Cellulose derivatives. Distribution of polysaccharides and lignin in wood. Wood extractives. Chemistry of bark. Formation of heartwood. Wood as a chemical raw material. Chemistry of the industrial pulping processes with emphasis on sulfite and kraft pulping of wood. Chemistry of the major bleaching agents. Chemical byproducts in the pulping industry. Complete tree utilization in the manufacture of pulp and paper. Fall, 1980.
Prerequisite: One or two semesters of a 3-credit undergraduate course in organic chemistry.

573. Wood Chemistry III: Biosynthesis of Wood (2)
Two hours of lecture. Chemistry of pectin and starch. Photosynthesis with emphasis on the chemical phase. Chemistry of the primary cell wall in plants. Biosynthesis of cellulose, hemicelluloses, pectin, and starch. Biosynthesis of aromatics, including lignin. Biodegradation of wood. Spring, 1981.
Prerequisite: FCH 575 or an equivalent course in general wood chemistry.

574. Wood Chemistry IV: Wood Chemistry Laboratory (1)
Three hours of laboratory. Reports. Gravimetric and spectrophotometric determinations of lignin. Determination of the number-average molecular weight of ethylcellulose by osmometry. Estimation of the weight-average molecular weight of ethylcellulose by viscometry. Calibration of a gel permeation chromatography (GPC) column. Separation and characterization of larch arabinogalactans A and B by GPC. Fall, 1980.
Prerequisite: FCH 575 Wood Chemistry I or an equivalent course in general wood chemistry.

630. Plant Biochemistry (3)
Three hours of lecture and discussion. Includes the biochemistry of photosynthetic electron transport and phosphorylation, photosynthetic carbon fixation, photorespiration, nitrogen fixation, nitrate reduction, photochrome, and plant hormones. The economic, ecological, and environmental aspects of plant biochemistry will also be discussed. Spring, 1981.
Prerequisites: FCH 530—532 or FCH 539 or equivalent.

650. Physical Chemistry of Polymers I (3)
Three hours of lecture. Includes: thermodynamics of polymer solutions, phase equilibria, fractionation, structure-property relationships, elementary chain statistics, molecular geometry, network elasticity, polyelectrolyte theory, and viscosity. Fall, 1980.
Prerequisites: One year of organic chemistry and one year of physical chemistry.

651. Physical Chemistry of Polymers II **(3)**
Three hours of lecture. Viscoelasticity. The glassy state and glass transition temperature. The crystalline state and crystallization kinetics. Characterization of structure and morphology of polymer solid states. Survey of structure and properties of native polymers. Spring, 1981.
Prerequisites: One year of organic and one year of physical chemistry.

652. Organic Chemistry of Polymers I **(3)**
Three hours of lecture. A broad survey of the chemistry of polyfunctional molecules and methods for their conversion to high molecular weight materials. Synthesis of a variety of specialty polymers and chemical reactions on natural and synthetic polymers. Some relations between molecular structure and useful properties. Fall, 1980.
Prerequisite: One year of organic chemistry.

653. Organic Chemistry of Polymers II **(3)**
Three hours of lecture. Kinetics and mechanism of polymerization processes, with emphasis on addition polymerization reactions initiated by radical, cationic and anionic initiators. Mechanism of stereospecific polymerization. Structure of polymers. Reactions on polymers and their modification for specific end uses. Block and graft polymers. Spring, 1981.
Prerequisites: One year of organic chemistry and one year of physical chemistry.

681. Principles of Physical Chemistry **(2)**
Two hours of lecture on chemical kinetics. Collision theory in the gas phase, transition state theory, kinetics in liquid solutions, ionic reactions including electron transfer reactions, rate equations near equilibrium, enzyme kinetics, and photochemical reactions. Spring, 1981.
Prerequisites: CHE 656 (Chemical Thermodynamics) or permission of the instructor.

682. Principles of Organic Structure and Synthesis **(3)**
Three hours of lecture and discussion. A broad survey of strategies for constructing organic molecules and of physical and chemical methods for the elucidation of structure. Emphasis on material relevant to different chemical disciplines. Fall, 1980.
Prerequisite: One year of organic chemistry.

796. Special Topics in Chemistry **(1-3)**
(Credit hours arranged according to nature of topic)
Lectures, conferences, and discussion. Advanced topics in physical chemistry, organic chemistry, or biochemistry. Fall and Spring, 1980-81.

798. Research in Chemistry **(Credit hours arranged according to nature of problem)**
Independent research in physical and organic chemistry of synthetic polymers, physical and organic chemistry of natural polymers, organic chemistry of natural products, ecological chemistry and biochemistry. One typewritten report required. Fall and Spring, 1980-81.

884. Organic Natural Products Chemistry **(3)**
Three hours lecture. The chemistry of terpenoids, steroids, and alkaloids with an emphasis on the determination of structure by both modern instrumental methods and chemical degradation. Biogenetic considerations and the confirmation of structure by synthesis are covered. Fall or Spring, 1980-81.
Prerequisite: One semester of advanced organic chemistry.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1980-81.

997. Seminar **(1)**
Seminars scheduled weekly; an average of twenty to thirty seminars are given annually. Discussion of recent advances in chemistry. Credit is given only once to a student. Fall and Spring, 1980-81.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1980-81.

FEG—FOREST ENGINEERING

300. Introduction to Forest Engineering and Design (2)
One hour of lecture and three hours of laboratory. An introduction to methodologies for general problem analysis and engineering design for resource utilization. Emphasis is placed on the relationship of engineered solutions of forestry problems and their effects on the resources and the natural environment. Fall, 1980.

340. Engineering, Hydrology, and Flow Controls (4)
Three hours of lecture and three hours of laboratory and discussion. Analysis of the waters of the earth, their occurrence, circulation, and distribution; physical properties and their interaction with their environment. Principles of hydrologic budgeting and routing; and basic hydraulics of open channel, conduit, groundwater and overland flow. Applications of probability as a basis for the design of solutions to groundwater, surface runoff, flooding and water supply problems. Spring, 1981.
Prerequisites: CIE 327, IOR 326, and APM 360.

350. Introduction to Remote Sensing for Engineers (2)
Two hours of lecture and three hours of laboratory. The fundamentals of acquiring, analyzing and utilizing remote sensing data in the performance of natural resource inventories, environmental quality surveys and site development analyses. Oriented for multidisciplinary participation. Spring, 1981.
Prerequisites: FEG 363 (or concurrent).

352. Introduction to Remote Sensing (3)
Three hours of lecture and three hours of laboratory. Qualitative and quantitative introduction to the fundamentals of acquiring, analyzing, and utilizing remote sensing data in the performance of natural resource inventories, environmental quality surveys, site development studies, and land use analyses. Oriented for multidisciplinary participation. Fall and Spring, 1980-81.
Prerequisites: Physics and calculus or permission of the instructor.

363. Photogrammetry (3)
Two hours of lecture and discussion, three hours of laboratory. Basic photogrammetric and photo interpretation concepts as a means of acquiring reliable data for engineering and management planning. Potentials, limitations, instrumentation, and unique requirements are considered. Fall and Spring, 1980-81.

410. Structures (4)
Three hours of lecture, three hours of computation laboratory and discussion. Engineering principles in the analysis, planning design and construction of components and framed structures under various types of loadings. The proportioning of wood, steel and concrete members and the design of statically determinate structural systems. Emphasis is placed on the relationship between theoretical stress analysis and codes and specifications for appropriate materials and structural design practices. Fall, 1980.
Prerequisites: ERE 362, APL Computing.

422. Production Systems Engineering (4)
Four hours of lecture. An introduction to concepts of production systems and procedures for planning, designing, and managing production and large-scale physical systems with an emphasis on the coordination of resources to achieve well-defined objectives. Topics include: the concept of systems analysis as a design process; linear and dynamic programming; and select mathematical and economic techniques applicable to resource engineering and management. Fall, 1980.
Prerequisites: FOR 206, FEG 300, IOR 326, and MAT 585.

437. Transportation Systems (4)
Three hours of lecture and three hours of laboratory. Interrelationships among natural features, transportation types, design, and management objectives to provide the most effective

system within the given framework. Basic engineering principles in the planning location, design, construction, and maintenance of suitable transportation systems to serve various aspects of forest resource management. Spring, 1981.
Prerequisites: ERE 371, FEG 340, FEG 410 and CIE 437.

447. Hydrologic and Quality Controls (3)
Two hours of lecture and three hours of laboratory. A continuation of FEG 340 coupled with principles and practices of water quality control for forested sites and low density areas. Design of facilities and systems for water, sewerage and waste water treatment and for the abatement of pollution from nonpoint sources. Planning and analysis for water resources development. Spring, 1981.
Prerequisites: FEG 340, ERE 488 and CIE 437 or equivalent.

464. Photogrammetry II (3)
Two hours of lecture, three hours of laboratory. General analytic photogrammetry including interior and exterior orientation systems, intersection, space resection and orientation. The design of photo coordinate, correction procedures for film deformation, lens distortions, atmospheric refraction and earth curvature. The planning and completion of a topographic mapping project. The design of optimum procedures for the photogrammetric project. Fall, 1980.
Prerequisite: FEG 363 or equivalent.

477. Survey Systems Design (3)
Three hours of lecture and discussion. A study of the development and present status of land surveys, including the U.S. Public Land System, plane coordinate system, land use and resource systems such as New York's LUNR system. The impact of survey upon land use. The design of future systems. Spring, 1981.
Prerequisites: ERE 371 and FEG 363.

489. Forest Engineering Planning (3)
Two hours of lecture and three hours of laboratory. A synthesis of the fundamental areas of forest engineering in the planning of the physical development of the forest resources. Specific design studies will be made emphasizing the interrelationship of man, forest resources and their multiple services. These studies will lead to the development and application of planning to simulated realistic conditions. Spring, 1981.
Prerequisite: Senior standing in Forest Engineering.

498. Research Problem in Forest Engineering (1-3)
Independent research in topics in Forest Engineering for the highly motivated undergraduate student. Selection of subject area determined by the student in conference with appropriate faculty member. Tutorial conferences, discussions and critiques scheduled as necessary. Final written report required for departmental record. Fall and Spring, 1980-81.
Prerequisite: Permission of the instructor.

FEN—ENTOMOLOGY (FOREST ENTOMOLOGY)

300. Principles of Forest Entomology (3)
Two hours of lecture, three hours of laboratory field work. Elements of insect classification, living requirements and control manipulations that are prerequisite, with further study, to an understanding of insects in relation to applied aspects of forestry. Spring, 1981.

350. Elements of Forest Entomology (3)
Two hours of lecture, three hours of laboratory/field work. General classification of insects, morphology, physiology, ecology behavior, and basic principles of population control. Emphasis through illustration is on the role of insects in the forest environment. Fall, 1980.
Prerequisite: FBO 300.

402. Forest and Shade Tree Entomology (3)
Two hours of lecture, three hours of laboratory/field trip. Important forest and shade tree insects; detection, evaluation, prevention and control of their damage; their relation to silviculture and management of forests and shade trees. Spring, 1981.
Prerequisite: FEN 350 or FEN 300.

404. Wood Deterioration by Insects (3)
Three hours of lecture, discussion, and demonstration. Biology, identification, ecology of insect and wood interrelations; prevention of injury and control of insects injurious to forest products and wood in use. Spring, 1981.
Prerequisite: FEN 350, FEN 300 or permission of the instructor.

450. Forest and Aquatic Insects (2)
Half-time for four weeks. Cranberry Lake Biological Station. The forest and aquatic insects of Cranberry Lake Region and their role in these environments and habitats. Insect collection required. Summer, 1981.

451. Pest Management—Theory and Practice (2)
Two hours of lecture for nine weeks; then one lecture hour and one three-hour laboratory for four weeks. A review of history and governmental policy of pest management, as well as basic instruction in theory and practicum. Spring, 1981.

452. Principles of Chemical Control (3)
Two hours of lecture; one three-hour laboratory. A study of the chemistry, toxicology, handling and application of chemicals used to manage pest populations. A primer for the State Pesticide Application examinations. Fall, 1980.
Prerequisite: FEN 451.

453. Biological Control (2)
Two hours of lecture. Theory and practice of biological control of insect pests and weeds. Emphasis on the ecology of major groups of predators, parasitoids, and pathogens used in pest management and interpretation of mortality. Fall, 1980.

460. Insect Behavior and Ecology (2)
Half-time for four weeks. Cranberry Lake Biological Station. Descriptive, comparative, and experimental behavior of aquatic and terrestrial insect species of the Cranberry Lake Region. Field project, involving field study and paper required. Ecology of forest insects and field techniques used in their study. Emphasis on functional roles played by insects in forest ecosystems. Summer, 1981.
Prerequisite: FEN 350 or equivalent; background in introductory biology and ecology.

490. Medical Entomology (3)
Two hours of lecture, three hours of laboratory. Study of arthropods affecting man, domestic animals, and wildlife with emphasis on their biology, control, and relationship to vertebrate disease. Spring, 1981.
Prerequisite: A beginning course in biology, entomology, zoology or permission of the instructor.

510. Arachnology (3)
Two hours of lecture and discussion and three hours of laboratory. Introduction to biology and ecology of spiders, mites, scorpions and other arachnid groups. Laboratories emphasize classification and identification of specimens. Spring (even years), 1982.
Prerequisite: Course in general entomology or invertebrate zoology.

520. Aquatic Entomology (3)
Two hours of lecture and three hours of laboratory. The biology, ecology and identification of fresh water insects, with emphasis on the role of aquatic insects in the hydrobiome. Fall, 1980.
Prerequisite: FEN 350 or equivalent.

560. Environmental Toxicology of Insecticides (2)
Two hours of lecture. Basis of action of insecticides in living systems, behavior of insecticides and microtoxicants in environment, interaction of insecticides and biological systems. Fall, 1980.
Prerequisite: FBL 330 or equivalent course in physiology or biochemistry.

580. Insect Morphology (3)
Two hours of lecture and three hours of laboratory. A comparative study of the external morphology of insects emphasizing evolutionary trends, especially modifications of homologous structures. Topics of special importance include intersegmental relationships, feeding, sensory mechanisms, locomotion, and reproduction. Spring, 1981.
Prerequisite: FEN 350.

610. General Insect Taxonomy (3)
Two hours of lecture and three hours of laboratory. Identification and classification of the important orders and families of insects; acquaintance with pertinent taxonomic literature and use of keys; and understanding of evolutionary principles and concepts and a knowledge of systematic theory and practice. Insect collection required. Fall, 1980.
Prerequisites: FEN 350, FEN 580.

630. Insect Physiology (3)
Two hours of lecture and three hours of laboratory. Study of the life processes in insects; introduction to modern physiological instrumentation and laboratory methods. Spring, 1981.
Prerequisite: FBL 330.

650. Histological Techniques (2)
Two three-hour laboratories. A study of the series of actions involved in preserving insect tissue through fixation, embedding, and staining and the process of observing and identifying tissue sections through microscopic analysis. Fall, 1980.
Prerequisite: Permission of the instructor.

660. Insecticide Toxicology Laboratory (2)
One hour of discussion and three hours of laboratory. Laboratory experiments in mode of action and behavior of insecticides, biological and instrumental analysis of insecticides including tracer analyses. Spring (odd years), 1981.
Prerequisites: FEN 560 or equivalent and permission of the instructor.

796. Special Topics in Forest Entomology
(Credit hours arranged according to nature of work)
Special instruction, conference, advanced study, and research projects in the fields of insect toxicology, insect physiology, taxonomy of immature insects, phases of biology and ecology of insects. Typewritten report required in some fields. Fall and Spring, 1980-81.

797. Seminar (1)
One hour of conference. Assigned reports and discussion of topics in entomology. Fall and Spring, 1980-81.

798. Research Problems in Forest Entomology
(Credit hours arranged according to nature of problem)
Comprehensive report required in some projects. Fall and Spring, 1980-81.

810. Advanced Insect Taxonomy (3)
Two hours of lecture and three hours of laboratory. Methods, procedures, and concepts of systematics. Examples and material will be drawn from among important groups of forest insects. Fall, 1980.
Prerequisites: FEN 580 and FEN 610.

820. Taxonomy of Diptera (3)
One hour of lecture and discussion and six hours of laboratory. Methods and procedures for collecting, preserving, and determining generic and specific identifications of adult and larval

flies will be practiced. Problems and concepts of Diptera systematics will be discussed. Fall (even years), 1980.

Prerequisites: FEN 350, FEN 580, FEN 610; FEN 810 suggested.

860. Advanced Toxicology of Insecticides (3)

Three hours of lecture and discussion. Review of current topics in toxicology of insecticides and related foreign compounds. Fall, 1980.

Prerequisites: FEN 560, FCH 530 and permission of the instructor.

899. Master's Thesis Research (Credit hours to be arranged)

Research and independent study for the master's degree and thesis. Fall and Spring, 1980-81.

999. Doctoral Thesis Research (Credit hours to be arranged)

Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1980-81.

FOR—FORESTRY (RESOURCES MANAGEMENT)

100. Introduction to Forestry and Environmental Management (3)

Two one- and one-half hour meetings. An introduction to environmental and resources management. Emphasis is placed on the breadth of the field and on the important interrelations among the social, physical, and managerial aspects within which the environmental manager operates. Specific topics include: resources, institutions, values, the physical environment, the organism, the biological system, goals, management problems, information and analysis, and dealing with people. Fall, 1980.

205. Introduction to Macroeconomics (3)

Three hours of lecture and discussion. Composition, measurement, and determination of national income. Financial institutions of the United States. Monetary and fiscal policies. The theory of economic growth and problems in attaining adequate levels of economic growth. Spring, 1981.

206. Introduction to Microeconomics (3)

Three hours of lecture and discussion. Pricing and resource allocation. Supply and demand. Theory of the firm and industry. The role of labor unions in the American economy. Problems in antitrust policy. The theory of international trade. Fall, 1980.

300. Summer Program in Field Forestry (6)

Fundamental training in forestry disciplines demonstrating elements of resource inventory, ecology and utilization within the context of total resource management. Course consists of five six-day weeks of field exercises, reports and projects in areas of surveying and cartography, forest and tree measurements, dendrology, ecology, and utilization of forest goods and services. Daily exercises develop understanding through active physical participation by students. Two repeating sessions per summer held at Warrensburg Campus. A service charge is required covering individual expenses while in residence at Pack Demonstration Forest, Warrensburg, New York. Summer, 1981.

321. General Silviculture (3)

Two hours of lecture and one three-hour laboratory first half of semester, three hours of lecture last half of semester. Survey of silvical principles and concepts and practice of silviculture for the production of goods and services from the forest. Designed for students in curricula other than resources management. Not available for resources management majors. Fall, 1980.

322. Introductory Forest Mensuration (3)

Two hours lecture and discussion, one three-hour laboratory. Principles and methods of estimation and measurement of forest trees and products, singularly and in the aggregate; of trees, forest products, forest stands, forest growth in time area and value. Determination by graphical and mathematical analysis of volume, growth, and valuation of wood products and other nonwood products and services of the forest through laboratory problems. Fall, 1980.

Prerequisite: Summer Field Program or permission of the instructor.

331. Introduction to the Physical Environment (6)
Lectures, discussions, field and laboratory work blocked in time and subject matter with FOR 332, Silvics-Silviculture. Study of the environmental media: air, soil, and water, through examination of the flow of energy and matter within and between these components of the environment. Drawing together information from geology, physical geology, soil science, water science and meteorology, this course provides understanding of these areas, their interactions and the interface with the biological system. Fall, 1980.
Prerequisite: Junior year standing in FOR curriculum or equivalent. Course should be taken concurrently with FOR 332, Silvics-Silviculture, because of the blocking of these two courses.

332. Silvics-Silviculture (8)
Three one-hour lectures and five three-hour labs or field trips. Fundamentals of silvics and practices of silviculture enabling manipulation of forests to attain objectives of the forest owner. Emphasis is placed on the biological interrelationships within the forest community, including site factors and forest stand dynamics, and the consideration of these in silvicultural operations. Fall, 1980.
Prerequisites: Summer Program in Field Forestry, and FOR 331 (taken concurrently) or permission of the instructor.

335. Regional Silviculture (3)
Three hours of classroom study. Topics cover regional factors that influence silvicultural methods commonly used in different forest types. Provides study of various silvicultural systems used in operating forest properties in various regions, with attention to geographical differences in land use, market opportunities, species characteristics, and economic conditions. Spring, 1981.
Prerequisite: FOR 332 or FOR 321.

345. Soils (3)
Three hours of lecture and discussion. Introduction to the fundamentals of soil science with particular reference to forestry, but including other land uses. Spring, 1981.

351. Meteorology and Fire Behavior (3)
Lectures and recitations in atmospheric physics and the physics and chemistry of combustion lead to discussions of fire behavior and the strategy and tactics of fire suppression. Fall, 1980.
Prerequisites: PHY 103 and 104 (Calculus helpful but not required).

360. Principles of Management (3)
Three hours of lecture and recitation. Basic principles and concepts of management which are universally applicable to any organization, business enterprise, or public agency. The various approaches to management including the classical, behavioral and quantitative concepts with emphasis upon the integrative approach, now required to meet modern society's changing life styles and values and the new awareness of the public regarding environmental matters and natural resources management. Spring, 1981.

362. Forest Information Systems (4)
Data needs, as specified by management goals and resource constraints, and the manner in which these needs influence acquisition, storage, retrieval, and prediction. Spring, 1981.

364. Soil and Water Conservation (3)
Three hours of lecture. An integrated historical survey of water and related land resource conservation in the United States. Interrelationships of planning, administration, and evaluation of policies, programs and projects by all levels of government and private units. Spring, 1981.

370. Management of the Forest Enterprise (3)
Two hours of lecture and one hour of discussion and laboratory. This course is concerned with the management alternatives, both of a technical and social nature, that are available in the planning for and the production of timber, recreation, wildlife, forage, and water from the forest and with the criteria for choice to meet management objectives. Spring, 1981.

371. Range Management **(2)**
Two hours of lecture. Range ecology, animal husbandry, management practices and administrative aspects of range resources. Spring, 1981.

372. Planning and Developing Access for Forest Use **(3)**
Two hours of lecture, and one three-hour laboratory and discussion. Planning and developing suitable access necessary in producing a wide range of goods and services derived from forest land. Overland and aerial access systems including costs, consideration of user characteristics, aesthetics, standards, maintenance, and evaluation of alternatives in location and development. Fall, 1980.
Prerequisite: Senior standing or permission of the instructor.

373. Timber Harvesting **(3)**
Two hours of lecture and one three-hour laboratory and discussion. Harvesting as a production system including equipment, equipment mixes, costs and manpower in serving and logmaking and primary and secondary transportation. Evaluation of various systems as to environmental impacts. Wood as a raw material to the primary processing system and trees as inputs to the harvesting system. Spring, 1981.

400. The Social Environment of Resource Management **(3)**
Three hours of lecture and discussion. This course describes the institutional framework within which the resource manager practices his profession. It intends to show how economics, law, public policy, pressure groups and financial considerations constrain the professional judgment of the resource manager and the goals and objectives of the institution employing him. Fall, 1980.
Prerequisites: FOR 332, 360, 461, 322 and one hour of computer science; Senior standing.

402. Legal Aspects of Surveying **(3)**
Three hours of lecture and discussion. Fundamental principles of real property law with special reference to boundary survey, conveyances, rules of evidence, title insurance, rights, duties, and liability of professional land surveyors. Case material and appropriate New York State statutes will be discussed. Fall, 1980.

404. Economics of Wood-Using Industries **(3)**
Three hours of lecture and discussion. Structure and organization of selected wood-using industries. Analysis of decisionmaking by the firm. Principles of production and marketing including demand and cost analysis and pricing. Special issues and current problems of the industries, and introduction to the newer mathematical and statistical tools for meeting them. Spring, 1981.
Prerequisite: FOR 204 or equivalent.

405. World Forestry Resources: Problems and Prospects **(3)**
Three hours of lecture and discussion plus guided readings, pertaining to world forest resources and the problems and opportunities associated with their use and development. Major topics include: world forest resources; production and trade; principal wood-producing countries; forestry and the problems of underdevelopment; and special areas and topics of interest to world forestry. Spring, 1981.
Prerequisite: Senior status preferred.

429. Environmental Impact: Principles and Strategy **(3)**
Three hours of lecture and discussion. Principles and theory of environmental impact and statements of impact as required by federal law. Administrative procedures for review and evaluation. Procedural strategy and effective constitution before various governmental levels. Means of obtaining and sources of authoritative information. Spring, 1981.
Prerequisite: Senior standing.

433. Commodity Production Silviculture **(3)**
Six hours of lecture and study, or field work. Classroom instruction and exercises will introduce topics, followed by field exercises stressing application of silvicultural methods for growing wood products, mostly in hardwood stands. Topics will cover concepts, techniques,

diagnostic methods, and field application for thinning, reproduction methods for even- and uneven-aged stands, assessing site and stand capabilities, and measuring and evaluating stand growth and development following management, where producing wood and other commodities represents a primary goal. Offered one day per week as a block of instruction and exercise. Spring, 1981.

Prerequisites: FOR 331-332, FOR 335, and one mensuration course beyond Summer Program in Field Forestry; Senior standing.

434. Greenspace Silviculture **(3)**

Two hours of lecture, one to three hours seminar or field trip. Concepts, techniques, and field practice of evaluating and manipulating vegetation systems, including site conditions, woody and herbaceous vegetation, and use impacts, primarily for on-site values in park, recreation, wildlife and multiple-use lands, roadsides, utility rights-of-way, protection areas, etc. Fall, 1980.

Prerequisites: At least one silviculture course and senior status. Permission of the instructor.

435. Integrated Use Silviculture **(3)**

Four hours of lecture and seminar during first half of semester; six hours of field practice thereafter each week. Development of silvicultural decisions in management of woodlands to achieve results under various integrated use objectives. Trips to forest areas. Several technical reports and a cultural plan prepared prescribing treatment to attain various ownership objectives. Spring, 1981.

Prerequisites: FOR 331 and 332 or permission of the instructor. Senior standing.

440. Forest Hydrology **(3)**

Two hours of lecture; three hours of laboratory. The relation of forest and range vegetation to its environment, and its effect upon soil and water. Measurement of precipitation, runoff, erosion, and other variables. Fall and Spring, 1980-81.

441. Forest Influences **(1-2)**

Half time for four weeks. Cranberry Lake Biological Station. Field observation of the effect of the presence of forest vegetation on easily quantified parameters of climate and the hydrologic cycle. Basic measurements of precipitation, radiation, temperature, interception, soil moisture, groundwater, and streamflow. Summer, 1981.

442. Practice of Watershed Management **(3)**

Two hours of lecture, three hours of laboratory. The impact of the multiple use of forest and range lands on water yield and soil stability. Regional problems and potential solutions. Spring, 1981.

Prerequisite: FOR 440.

446. Forest Soil Classification, Survey, and Interpretation **(3)**

Two hours of lecture and discussion, one three-hour laboratory. Detailed examination of soil genesis and classification, and the survey and description of the soilscape. Interpretations are made for various land uses, especially forestry. Spring, 1981.

Prerequisites: FOR 331 or 345 or an introductory soils course.

452. General Meteorology **(3)**

Three hours of lecture. Examination of the physical processes of the atmosphere as they relate to the exchange of heat, moisture, and momentum in the earth-atmosphere system. Emphasis on the meteorological and micrometeorological basis of climate and its interaction with the biological world. Spring, 1981.

453. Biometeorology **(2)**

Two hours of lecture and discussion covering the fundamentals of organism-physical environment interaction. Spring, 1981.

455. Forest Tree Improvement **(3)**

Two hours of lecture, three hours of laboratory or field work. General principles and methods of tree improvement practiced in this country and abroad. Tree selection, techniques of vegetative propagation, hybridization, polyploidy, establishment of seed orchards, clonal and offspring testing and other problems. Spring, 1981.

Prerequisites: FBL 470, or Introduction to Mendelian Genetics or Population Genetics.

456. Management of the Forest Business (3)

Three hours of discussion. Overview of major business management principles and methods of operation in forestry enterprises. Emphasis is on general business concepts which forest managers must use. Actual case studies are basis of instruction. Complementary to RMP 611. Fall or Spring, 1980-81.

461. Management Models (3)

Two hours of lectures, three hours of laboratory. Introduction to the various models used in managerial decisionmaking. Emphasis is on the characteristics of the various models: their formulation, assumptions, uses, and limitations. The major topics covered will include: the role of models in management; simple optimization; constrained optimization; multi-valued choices; time adjustment of value; simulation; and models in nondeliberated decisions. Integration of the deliberative and intuitive models is stressed. Fall, 1980.

464. Applied Communications (3)

Two hours of lecture, three hours of laboratory during first part of course. Major media production project required. Course objective is to acquaint students with the basic principles of instructional communications in the teaching-learning process. Various media including television, motion pictures, exhibits, illustrated lectures, slide talks, newspapers, etc., are examined with emphasis on their utilization in environmental education. Also, consideration is given to instructional design for meeting predetermined learning objectives in various publics—lay and professional adult audiences, school children, etc. Spring, 1981.

465. Managerial Economics (3)

Three hours of lecture and discussion. Analysis of decisionmaking by the firm. Review of principles employed in modeling, predicting, risk assessment, evaluation and selection of alternative actions. Emphasis on economic and financial decisions and on the delineation of systematic processes of decision. Spring, 1981.

Prerequisite: Not available to Resource Management undergraduates except with permission of the instructor.

471. Resources Management (3)

Three hours of lecture/discussion/recitation/case studies. The interrelationships between man and forest land resources and the multiple services which these resources provide; the extent and nature of responsibilities of the resource manager to the community and to society in his stewardship of natural resources. Spring, 1981.

472. Fundamentals of Outdoor Recreation (3)

Three hours of lecture. Introduction to the programs and practices of federal, state, and local agencies and private organizations involved in planning, administration, and management of outdoor recreation areas. Emphasis is on major recreational issues and conflicts faced by area managers, and how they integrate solutions into their plans. Spring, 1981.

473. Planning and Development of Forest Recreation Areas (3)

Three hours of lectures or equivalent laboratory and assignments. Planning and designing forest recreation areas, structures, and facilities. Development of construction plans for camp and picnic sites, for waterfront areas and for trails. Emphasis is on the functional relationship between planning and design, management, and maintenance. Field trips required. Fall, 1980.

Prerequisites: FOR 472 and permission of the instructor.

475. Sociology and Psychology of Leisure Behavior (3)

Three hours of lecture and discussion. Introduction to theory and research findings dealing with the sociological and psychological aspects of leisure behavior; field work and lectures demonstrate applications, particularly with regard to leisure behavior. Spring, 1981.

Prerequisites: FOR 472, and an introductory course in sociology or psychology, or permission of the instructor.

477. Resource Policy and Management (3)
Three hours of lecture supplemented by one hour of discussion and/or lecture. Public and private forest policy formation; principles of modern management; overall management and operation of a productive forest property. Primarily for forest engineers. Not available to Resource Management undergraduates. Fall or Spring, 1980-81.
Prerequisites: Mensuration and silviculture, senior standing in Forest Engineering, or by permission of the instructor.

478. Marketing of Forest Products (3)
Three hours of discussion and analysis. Case study analysis of product, pricing and market research policies and problems of market structure in the lumber, pulp and paper and other major wood-using industries. Spring, 1981.

480. Urban Forestry (3)
Two hours lecture and three hours of laboratory or field trip. Introduction to urban forestry: its professional status and potentials. Elements of urban physical geography. Nature and functions of various kinds of urban greenspace; their physical and social interactions as an integrated system, and management within the broader context of urban processes. Field practice in evaluating urban greenspace resources. Spring, 1981.
Prerequisites: Senior status. FOR core courses or permission of the instructor. For students in other schools FOR 434 is desirable.

496. Special Topics in Environmental and Resource Management (1-3)
Guided readings, lectures, discussions, tutorial conferences, or special coursework designed to help the undergraduate student apply scientific analysis of a social, biological, or physical nature to questions within his area of interest. Questions and analyses would include those dealing with forest resources management and administration; forest cultural practices; land use and land use planning; hydrology and watershed management; outdoor recreation; resource economics; world forestry; and others. Fall and Spring, 1980-81.
Prerequisite: Permission of the instructor.

497. Resources Management Seminar (3)
Three hours of group discussion and analysis. Current literature, plans and principles, and new developments in forest management. Fall or Spring, 1980-81.

498. Special Studies in Environmental and Resource Management (1-3)
Independent research in environmental and resource management for selected undergraduate students. Selection of subject areas determined by the student in conference with appropriate faculty member. Final written report is required for departmental record. Fall or Spring, 1980-81.
Prerequisite: Permission of the instructor and department chairman.

499. Independent Study in Resources Management (7-17)
Independent study of some significant aspect of environmental and resources management. The selection of the topic will be determined by the student in consultation with his advisor. Guidance will be provided by a faculty committee. Limited to Spring semester seniors in Resources Management. Spring, 1981.

FTC—FOREST TECHNOLOGY

200. Dendrology I (2)
Twenty-five hours of lecture and 34 hours of field time. A study of the distinguishing characteristics, growth features, distribution, associates and importance of the major tree species of North America. Seasonal field identification and on-the-spot discussion of habitats, associates, and the place in succession of the predominant forest trees and shrubs as found in the Adirondack area of the Northeast, plus a limited number of introduced species. Fall, 1980.

202. Plane Surveying I **(4)**
Fifty-four hours of lecture and 100 hours of field and laboratory time. An introduction to the theory and practice of plane surveying. Emphasis is on individual skill development through small crew projects, handling typical surveying equipment in typical field situations. Lecture topics include the theory of measurements and errors, mathematics for plane surveying, introduction to field problems and introduction to map use and preparation. Field projects include traversing, methods, and proficiency projects in handling typical surveying instruments. Fall, 1980.

203. Plane Surveying II **(1)**
Twelve hours of lecture and 32 hours of field time. A continuation of FTC 202 with emphasis on small crew field projects introducing the use of the engineer's level and the theodolite. Classroom work is directed at explaining the United States Public Land Survey system and introducing the concepts of modern deed descriptions and recordkeeping procedures. A trip to the County Court House is scheduled for a first hand look at a modern deed and record keeping operation. Spring, 1981.
Prerequisite: FTC 202.

204. Forest Mensuration and Statistics I **(3½)**
Sixty-seven hours of lecture and 36 hours of field time. A classroom and field study of the basic principles and skills required for timber measurements. Volume tables, their use and construction are studied. Cruise reports are required in which the student presents cruise results. Various methods of forest sampling are studied including methods of calculating necessary sampling intensities and sampling errors. Fall, 1980.

205. Forest Mensuration and Statistics II **(2)**
Four hours of lecture and 44 hours of field and laboratory time. A field problem of practical nature utilizing methods for collecting, analyzing, and presenting data dealing with timber volumes. Spring, 1981.
Prerequisite: FTC 204.

206. Forest Ecology **(3)**
Forty-two hours of lecture and 50 hours of field time. Study of weather and weather data collection; students manning a forest weather station. Study of weather and soil factors as to how they affect trees and forests, plus the interactions within the forest community and with the environment. Introduction to cover type mapping. Final field problem and report on detailed measurement and analysis of a belt transect. Fall, 1980.

207. Aerial Photogrammetry **(2)**
Twenty hours of lecture and 36 hours of laboratory. Development of the ability to interpret important ground features by viewing aerial photos singly and in pairs, using stereoscopic techniques and equipment. Scale problems and the making of reliable horizontal and vertical measurements. Radial line plot control for the transfer of detail to base maps. Forest type mapping and forest mensuration using photos. Fall, 1980.

208. Forest Installations **(3)**
Thirty-six hours of lecture and 60 hours of field time. This course provides the student with the technical competence necessary to use, plan, construct, and maintain such typical forest improvements as telephone lines, radio systems, trails, and light frame structures. Fall, 1980.

209. Forest Roads **(2)**
Twenty-two hours of lecture and 32 hours of laboratory time. This course provides the student with the technical competence necessary to administer, locate, and design the construction and maintenance of a typical forest gravel road. Spring, 1981.
Prerequisite: FTC 202.

211. Silviculture **(2½)**
Thirty hours of lecture and 40 hours of laboratory and field work blocked with forest management. Lectures based on text study cover orientation, terminology and present a framework of the various treatments used in many common stand conditions to bring the forest into a more productive state in accord with the objectives of management. Emphasis on thinning in computer simulation and field practice. Exercises in planting and pruning. Demonstrations in chemical silviculture. Spring, 1981.
Prerequisite: FTC 206.

212. General Forestry **(1)**
Sixteen hours of lecture. This course provides a brief overview of the development of forestry in the United States, the multiple-use concept of forestry, current public and private programs in forestry (including current events), and the place of forest technicians in forestry. Career opportunities for forest technicians are explored. Spring, 1981.

213. Forest Protection I **(2)**
Thirty-eight hours of lecture and 36 hours of laboratory/field time. A study of the insect and disease agents that damage trees and their role in the total forest community. The course covers identification of local forest insects and disease-causing organisms, study of the major pest groups of other forest regions, and control measures including the effects of pesticides on the environment. Field trips cover local pests and the damage caused, while laboratory work covers major groups of pests likely to be encountered elsewhere. Fall, 1980.

214. Personnel Management **(1½)**
Fourteen hours of lecture and 12 hours of laboratory. A study of company and agency organization functions, including selection of and placement of personnel, training of personnel and performance evaluations, planning for and administering crew responsibilities, human relations in the working situation and special personnel problems of the forest are covered. Techniques of foremanship are applied in various field exercises in other courses, along with the duty of safety hazards, accident prevention, accident classification and accident reporting. Spring, 1981.

215. Timber Harvesting **(2)**
Sixteen hours of lecture and 36 hours of field time. This course acquaints the student with the basic harvesting methods and techniques, with emphasis on the Northeast, along with the knowledge of how and where harvesting fits in with other forest uses. Students gain technical competence in timber sale contract administration and basic timber appraising. Spring, 1981.

217. Forest Management **(2½)**
Thirty-six hours of lecture and 40 hours of laboratory and field work blocked with silviculture. Coverage of the common problems met in organizing a forest property to approach the goals of ownership. Study and practice in techniques of growth measurement and the gathering and use of forest records in general. Summary application of pertinent information from many other courses in a work plan involving management decisions for an assigned forestry property. Spring, 1981.
Prerequisite: FTC 206.

218. Forest Recreation **(1½)**
Fifteen hours of lecture and 32 hours of laboratory or field time. This course acquaints the student with the forest recreational resources—its present and future needs. Principles of recreation development and management are discussed with special emphasis placed on the technical aspects. Spring, 1981.

219. Elements of Wildlife Ecology **(1½)**
Twenty-eight hours of lecture and four hours of field time. A study of the principles of wildlife ecology with fundamentals related to the actions of the preservationist, conservationist, and particularly those of the forest manager. Spring, 1981.
Prerequisite: A course in biology or its equivalent.

221. Water Resource Management (2)
Twenty-seven hours of lecture and 40 hours of field time. A comprehensive study of the concepts of the hydrologic cycle and quantification of its components. Particular stress on basic water measurements, erosion-sedimentation, and protection of the soil-water resource. Spring, 1981.
Prerequisite: FTC 206; FTC 202.

223. Graphics (1)
Twenty-two hours of lecture. An introduction to lettering and drafting with emphasis on the skills needed by the forest or surveying technician. Individual skill development is achieved through several projects. The concept behind each project is explained in handout material and lecture, and each student is then expected to complete the project on his/her own time. Freehand and mechanical lettering plates are produced in addition to precision and pictorial drawings. Fall, 1980.

225. Regional Forestry Practices (1)
Forty hours of field time. An eight-day field trip to provide concentrated and varied field observation. It is conducted during the fourth semester to give the student first-hand observation of the current forestry practices in some region of the United States. Spring, 1981.

227. Forest Protection II (2)
Twenty-three hours of lecture and 24 hours of field and laboratory time. The basic principles of fire ecology, forest fire behavior, fire danger and fire danger rating, forest fire prevention and control, and prescribed burning are covered. Handtool fire suppression techniques are demonstrated and practiced. Spring, 1981.
Prerequisite: FTC 213.

228. Structure and Growth of Trees (1)
Thirteen hours of lecture and eight hours of laboratory. A study of the various tissues of forest trees and how their growth and development are affected by internal and external factors. Differences in stem structures of some of the more important commercial tree species of the United States are studied in the laboratory, and these differences are related to the commercial uses of these species. Spring, 1981.
Prerequisite: An introductory course in general botany or biology.

229. Silviculture II (2)
Twenty-six hours of lecture and 28 hours of field and laboratory. Continuation of FTC 211 dealing mainly with the handling of the more complex hardwood and mixed stands common to the Northeast. Special coverages will be offered on current practices of regional importance beyond the Northeast where graduates are likely to be employed. Spring, 1981.

230. Plane Surveying III (2)
Twenty-six hours of lecture and 28 hours of field time. A continuation of FTC 202 and FTC 203 with emphasis on small crew projects using the theodolite. Advanced field techniques are discussed and practiced, such as the determination of the true meridian by the method of direct solar observation, layout of highway curves and simple triangulation procedures. Each topic is developed in detail in the classroom before each field project is completed. Spring, 1981.
Prerequisites: FTC 202 and FTC 203.

FZO—ZOOLOGY (FOREST ZOOLOGY)

332. Wildlife Conservation (3)
Two hours of lecture, one hour of recitation. Introduction to the biological principles of conservation including the relationship of natural resources to modern society. The wildlife resource and its conservation will be emphasized. It is not designed for students concentrating in the area of Forest Wildlife Management. Fall, 1980.
Prerequisite: One semester of biological science.

381. Vertebrate Anatomy, Histology and Physiology I (4)
Three hours of lecture, three hours of laboratory. Vertebrate macroanatomy, microanatomy, and physiology with special emphasis on the skeletal, muscle, nerve, and endocrine systems. Fall, 1980.
Prerequisite: General zoology or general biology.

382. Vertebrate Anatomy, Histology and Physiology II (4)
Three hours of lecture and three hours of laboratory. Vertebrate macroanatomy, microanatomy, and physiology with special emphasis on digestion, metabolism, nutrition, circulation, respiration, excretion, and body defense and destructive systems. Spring, 1981.
Prerequisite: General zoology or biology.

411. Invertebrate Zoology (4)
Three hours of lecture, three hours of laboratory. Structure, function, classification, and evolution of invertebrates. Emphasis on ecological role of invertebrates in specific habitats. Fall, 1980.

413. Biology of Birds and Mammals (4)
A course surveying the taxonomy, anatomical-behavioral-physiological adaptations and natural history of birds and mammals. Techniques for the field study of a vertebrate species will be discussed. Fall, 1980.

415. Herpetology (3)
Two hours of lecture and three hours of laboratory. An introduction to the structure, function, ecology, behavior, development and distribution of amphibians and reptiles as they relate to the systematics of the various groups. Spring, 1981.

416. Ichthyology (3)
Two hours of lecture, three hours of laboratory. An introduction to the anatomy, physiology, ecology, behavior, and taxonomy of fishes. Spring, 1981.

423. Microcommunity Ecology (2)
Half-time for four weeks. Cranberry Lake Biological Station. Study of terrestrial invertebrate microcommunities; descriptive and comparative assay of microhabitats incorporating experimental and field techniques. Summer, 1981.

424. Vertebrate Ecology (2)
Half-time for four weeks. Cranberry Lake Biological Station. Utilization of unique Adirondack forms and communities to study population dynamics, behavior, systematics, and ecological role of vertebrates; standard field and laboratory techniques. Summer, 1981.

426. Ecology of Adirondack Fishes (2)
Half-time for four weeks. Cranberry Lake Biological Station. Study of the ecology of fishes, with detailed individual investigation of the ecology of Adirondack fishes. Summer, 1981.

427. Field Ornithology (2)
Half-time for four weeks. Cranberry Lake Biological Station. Field study of the ecology, distribution and behavior of birds of the Adirondack region. Techniques used in conducting field studies in avian biology will be emphasized. Summer, 1981.

440. Fishery Biology (4)
Three hours of lecture and three hours of laboratory. Introduction to models of growth, mortality, production, and exploitation; aspects of fish ecology and behavior related to the dynamics and management of fish populations. Fall, 1980.
Prerequisite: FZO 416 or equivalent.

456. Wildlife Ecology and Management (3)
Three hours of lecture. A study of the ecological principles governing wild animal populations and their habitats and the relationship of these principles to management programs and decisions. Spring, 1981.
Prerequisites: FBL 320, general ecology or its equivalent.

457. Wildlife Management Practicum (2)
One hour discussion, three hours laboratory. Practical contact and experience with wildlife management techniques and programs; relates practices to principles of management. Designed for biology students wishing to pursue careers as wildlife biologists. Spring, 1981.
Co-requisite: FZO 456; Pre-or co-requisite LIB 300.

470. Principles of Animal Behavior (3)
Three hours of lecture per week. A study of the basic principles of animal behavior, stressing exogenous and endogenous mechanisms of control. Spring, 1981.
Prerequisite: One year of biology.

475. Behavioral Ecology (2)
Half-time for four weeks. Cranberry Lake Biological Station. Study of the behavioral adaptations of animals to their environment. Emphasis will be placed on animal orientation and social behavior. Habitat selection and interspecific interactions will also be considered. Credit may not be received for both FZO 475 and FZO 470. Summer, 1981.

520. Terrestrial Community Ecology (3)
Three hours of lecture. Relation of terrestrial vertebrates and invertebrates to their physical, chemical, and biological environment. Emphasis on community principles, structural quantification, and evolutionary processes of terrestrial animals. Fall, 1980.
Prerequisite: A course in basic ecology.

553. Wilderness Wildlife Management (2)
Two hours of lecture followed by one hour of group discussion. Students will participate in a two-day field trip at Huntington Forest. Completion of a term paper will be required for graduate credit. Fall, 1980.

620. Invertebrate Symbiosis (3)
Two hours of lecture and one three-hour laboratory. An introduction to the ecology and evolution of interspecific relationships of invertebrates. Spring (even years), 1982.
Prerequisites: FBL 320, FZO 411.

621. Practicum in Terrestrial Community Ecology (1)
Three hour laboratory. Intensive practical application of ecological principles to the study of terrestrial animal communities. Includes experimental and field collection of data, quantifications, synthesis, and final reporting. Fall, 1980.
Pre- or co-requisite: FZO 520 or equivalent.

622. Ecological Energetics (3)
Two hours of lecture and three hours of laboratory or one hour of discussion. Investigation of the principles of energy flow in biological systems. Emphasizing understanding of energy transformations, energy budgets and energy structures of individual organisms, populations, and ecosystems. Spring, 1981.
Prerequisite: A course in general ecology.

635. Behavioral and Physiological Ecology (3)
Two hours of lecture and one hour of discussion. An examination of the concepts of animal adaptations to ecological change from a behavioral point of view. Particular emphasis will be placed on the role the environment plays in shaping the behavior of a given species. Behavioral and physiological responses to environmental conditions will be treated as a continuum. Spring (odd years), 1981.
Prerequisites: One course in ecology, behavior, and physiology.

650. Biology and Management of Waterfowl (2)
A consideration of the identification, life history, ecology, and economic importance of waterfowl of the Atlantic Flyway. The management of local, flyway, and continental waterfowl populations, including the establishment of hunting seasons, will be discussed. One Saturday field trip. Fall (odd years), 1981.
Prerequisite: Permission of the instructor.

654. Habitat Inventory and Evaluation **(3)**
Four hours of lecture and discussion. Habitat analysis techniques are dealt with at two levels. Micro or taxon-specific techniques are surveyed and compared. Macro or regional inventory procedures are then examined. Finally, approaches to habitat evaluation are explored. Spring, 1981.
Prerequisites: A course in wildlife management principles and permission of the instructor.

655. Urban Wildlife **(2)**
Three hours of lecture and discussion with field trips. A study of the occurrence, adaptations, and values of wildlife in urbanized areas, with emphasis on current research and agency programs. Spring, 1981.
Prerequisite: Permission of the instructor.

659. Advanced Wildlife Management **(3)**
One hour lecture, four hours laboratory; two weekend field trips. For graduate students intending to enter the wildlife profession. Focus is on the application of ecological principles and management techniques in the planning of habitat and harvest management programs for wildlife. Extensive independent work required. Fall, 1980.
Prerequisites: FZO 456, FZO 457 or permission of the instructor.

720. Topics in Soil Invertebrate Ecology **(3)**
Two one-hour lecture and discussion periods and a three-hour laboratory. Study of literature relating to soil invertebrate microcommunities; taxonomy, culturing, and collection methods of soil fauna; student will conduct an individual research problem. Spring (odd years), 1981.

727. Seminar in Aquatic Ecology **(1)**
Two hours of lecture and discussion. A seminar to explore in some depth areas of current research in aquatic ecology. Fall (even years), 1980.
Prerequisite: Six credits in aquatic ecology.

750. Topics in Wildlife Biology **(1-3)**
Hours to be arranged. Group study of a wildlife management topic. Fall or Spring, 1980-81.
Prerequisite: Six credits of wildlife management courses.

797. Forest Zoology Seminar **(1)**
Two hours of discussion and assigned reports on current problems and new developments in forest zoology. Fall and/or Spring, 1980-81.

798. Problems in Forest Zoology **(Credit hours to be arranged)**
Individual study of special problems in forest zoology. One typewritten report (original and one carbon) required. Fall and/or Spring, 1980-81.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1980-81.

970. Topics in Animal Behavior **(2)**
Two hours of lecture and discussion. A seminar-type course designed to explore in depth selected and controversial subject areas in animal behavior. Fall or Spring, 1980-81.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1980-81.

GRA—GRAPHICS (LANDSCAPE ARCHITECTURE)

(See also courses listed under EIN and LSA.)

380. Technical Drawing **(1)**
One three-hour drafting room period. Elements of perspective, isometric, oblique, and orthographic projection. Practice in freehand and instrument drawing. Fall, 1980.

381. Technical Drawing **(2)**
Two three-hour drafting room periods. Elements of perspective, isometric, oblique, and orthographic projection. Practical applications of these principles in machine and architectural drawing, including piping and electrical drawings. Spring, 1981.

382. Graphic Communication **(2)**
Two three-hour studios with up to one hour of studio per week devoted to group presentation meetings, instruction, and review of new techniques such as diagramming, drafting, perspective, and plan graphics. Drawings, examinations, and a final portfolio constitute the basis for grades. Fall, 1980.

482. Advance Media **(1-3)**
Three hours of studio. Discussions, demonstrations, critiques and individual study. Study oriented toward perception and self-expression, use and possibilities of various media, as selected by student and instructor. Fall and Spring, 1980-81.
Prerequisites: Prior art media training or experience and permission of the instructor.

682. Video Communications **(3)**
Three hours of studio plus two hours of lecture. This course will provide students with instruction and experience in the skills necessary to provide video tape programs. Each student will prepare and develop a video script for production of a program on an assigned topic. Completed programs will be tested and evaluated. Class size is limited. Fall or Spring, 1980-81.
Prerequisite: Permission of instructor.

LIB—LIBRARY (COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY COURSE)

300. Library Research **(1)**
Fifteen hours of class time per semester (usually the first five weeks). Introduction for students at all levels to basic library material and the research process leading to preparation of a bibliography. Fall and Spring, 1980-81.

LSA—LANDSCAPE ARCHITECTURE

(See also courses listed under EIN and GRA.)

320. Introduction to Landscape Architecture and Planning **(2)**
Three hours of lecture. The course presents an overview of the professions of landscape architecture and planning. It surveys the historic and contemporary situations of environmental design and planning. The course introduces the socio-cultural and natural factors which influence the form and condition of the physical environment. It will introduce issues, personality, and projects. Fall, 1980.

326. Landscape Architecture Design Studio I **(3)**
Six hours of studio and one hour of lecture per week. The first in a sequence of studios focusing on the concepts, skills, and methods of design. This course introduces students to the basic vocabulary, concepts, and principles of design; the application and operation of these in the physical environment, development of three-dimensional spatial concepts. The requirements for this course include readings, examinations, field trips, design exercises, and projects. (Student field trip expense $125-150). Fall, 1980.
Prerequisite: Permission of the instructor.

327. Landscape Design Studio II **(3)**
Nine hours of studio. The second in a sequence of studios focusing on the concepts, skills, and methods of design. This course continued the development of design abilities through study of the interrelationship between the requirements of a design established in a program, the visual character of the site and the development of a designed result. The development of spatial concepts which meet principles of composition organization and a given set of requirements. The requirements for this course include readings, examinations, field trips, design exercises, and projects. (Student field trip expense $125-150). Spring, 1981.
Prerequisites: LSA 326 with a minimum grade of C and GRA 382.

330. Site Research and Analysis **(2)**
One hour of lecture and three hours of studio per week. This course will require those enrolled to apply principles of natural resources and processes to assess the land use and development potentials and limitation of a site. The principles will include landforms, soils, hydrology, climate, energy, and plant, animal, and human ecology. A variety of manual and computer techniques for data collection, analysis and synthesis of natural systems information will be explored. The course will concentrate on the comparison of synthesis techniques and their implications for land use and design decisionmaking. Occasional local field trips will be utilized. Spring, 1981.
Prerequisite: EIN 311 or permission of the instructor.

422. Landscape Design Studio III **(4)**
Twelve hours of studio per week. This course is a continuation of skill development, theory, and strategies as they relate to design issues and process. Emphasis is placed on in-depth investigation on projects of a direct scale illustrating form derivation and the man-made and natural form. Occasional field trips to illustrate various design solution. Fall, 1980.
Prerequisites: LSA 327 with a minimum grade of C, and LSA 330.

423. Landscape Design Studio IV **(4)**
Twelve hours of studio per week. This course emphasizes skill development, theory, and strategy as they relate to large-scale site design situations. Continues prior courses emphasis on design process and form manipulation. Occasional field trips to illustrate and inspect design form. Spring, 1981.
Prerequisite: LSA 422 with a minimum grade of C.

425. Orientation for Experiential Studio **(3)**
Three hours of lecture and recitation. Investigation and documentation of an area of specialty, discussion, readings, and research. Fall and Spring, 1980-81.
Prerequisite: Permission of the instructor.

433. Plant Materials **(2)**
Three hours of lecture and field work per week for first one-third of semester. Two hours of lecture per week for second one-third of semester. This course concentrates on woody plant materials used in landscape architecture, the ecological relationships of plants, ornamental plant materials use and identification, plant culture propagation, transplanting, planting plans and specifications. Fall, 1980.
Prerequisite: Permission of instructor.

442. Site Grading **(2)**
Two hours of lecture and three hours of studio per week during first two-thirds of semester. Lectures, projects, and assigned readings. The study of grading as the primary means of landform modification in landscape architectural design. Primary emphasis will be given to principles of grading, including contour manipulation, sections, profiles, and computations. Concepts of establishing acceptable slopes and positive surface drainage will be introduced. Enrollment limited to BLA or MLA students. Fall, 1980.
Prerequisite: LSA 330 Site Research.

443. Site Drainage Systems **(1)**
Three hours of lecture per week for last one-third of semester. Lectures, projects, and assigned readings. Provides a basis for the design of drainage systems. Coverage includes concepts relevant to understanding precipitation, methods of run-off quantification, open channel flow, systematic pipe network analysis. Enrollment limited to BLA or MLA students. Fall, 1980.
Prerequisite: LSA 330 Site Research.

444. Vehicular Circulation Design **(1)**
Three hours of lecture per week for first one-third of semester. Lectures, projects, and assigned readings. Must be taken concurrently with LSA 423. Introduces the circular geometry of horizontal curves and the parabolic geometry of vertical curves, curve coordination based on safety and aesthetic relationships, road grading. Enrollment limited to BLA or MLA students. Spring, 1981.
Prerequisites: Computer Programming and Surveying.

455. Professional Practice in Landscape Architecture (2)
Two hours of lecture per week. This course examines the historic and contemporary modes of landscape architectural practice including practice types, ethics, operations, and client systems. Particular emphasis is given to the projected trends of professional practice and with impact on future roles for the landscape architect. Professional development is reviewed as it relates to internship, licensing, and continuing education. Occasional field trips will be utilized. Spring, 1981.
Prerequisites: Senior status in landscape architecture or permission of instructor.

495. Selected Readings in Environmental Studies (1-3)
Exploration of selected readings in depth with individual independent study upon a plan submitted by the student and related to credit hours assigned. Upon approval of the instructor, the student may systematically investigate some subject area encountered in regularly scheduled courses or may initiate research on a variety of subject areas of determined relevance. Fall and Spring, 1980-81.
Prerequisite: Permission of the instructor.

496. Special Topics in Landscape Architecture (1-3)
One to three hours of class meetings. Special topics of current interest to undergraduate students in landscape architecture and related fields. A detailed course subject description will be presented as a topic area is identified and developed. Fall and Spring, 1980-81.
Prerequisite: Permission of the instructor.

498. Introductory Research Problem (1-3)
Guided study of a selection of problems relating to landscape architecture and environmental design. Emphasis on study procedure and methods employed. Enrollment at periodic intervals throughout the semester. Fall and Spring, 1980-81.
Prerequisite: Permission of the instructor.

522. Landscape Design Studio VI (4)
Twelve hours of studio. Studio problems, research, drafting and field trips. Concentration on complex urban problems. Concern for social and psychological considerations of the individual and large groups of people, their interaction and resultant forms of the environment. Spring, 1981.
Prerequisite: Permission of the instructor.

524. Experiential Landscape Studio Design (16)
Forty-eight hours per week. The articulation of the study proposal established in LSA 425, as approved by faculty, through research, readings, field study with graphic and written documentation, and group discussion. Academic study in an off-campus location in an area of landscape architectural significance, as described and delineated in a student-prepared proposal approved by the faculty. Fall or Spring, 1980-81.
Prerequisites: LSA 425 and LSA 423 with minimum grade of C.

525. Landscape Design Studio VI (4)
Twelve hours of studio. Investigation of a problem in landscape architecture as proposed by the student and conducted in conjunction with faculty advisor. Spring, 1981.
Prerequisite: Permission of the instructor.

527. Landscape Design Studio VI (4)
Twelve hours of studio. Studio problems, research, reports, and field trips. Concentration on regional landscape problems, the techniques of their analysis and derivation of their significance to the practice of landscape design. Spring, 1981.
Prerequisite: Permission of the instructor.

529. The Major Elements of Environmental Design (3)
Lectures, readings, discussions, and studios. The course presents an introductory survey of environmental design methods and associated skills and techniques. While studio work is part of the course, no design background is required. Fall, 1980.

533. Plant Materials **(3)**
Field trips and discussion. Ornamental woody plant identification. Observation and sketches of outstanding examples of planting design. Three weeks. Summer, 1981.
Prerequisite: Permission of the instructor.

545. Professional Practice Studio II **(2)**
Three hours of studio, one hour of recitation. Studio problems, research, discussion and recitation sessions on the processes and methods of office practice. Emphasis on all aspects of site development. Spring, 1981.
Prerequisite: Permission of the instructor.

547. Principles of Professional Practice **(2)**
Two hours of lecture. Lectures, assigned readings, reports, cost estimates, specifications, contracts, professional ethics, registration laws, professional practice. Spring, 1981.

595. Selected Readings in Landscape Architecture **(1-3)**
Exploration of selected readings in depth with individual independent study upon a plan submitted by the student and related to credit hours assigned. Upon approval of the instructor, the student may systematically investigate some subject area encountered in regularly scheduled courses or may initiate research on a variety of subject areas of determined relevance. Fall and Spring, 1980-81.
Prerequisite: Fifth-year status or permission of the instructor.

596. Special Topics in Landscape Architecture **(1-3)**
Experimental or special coursework in landscape architecture for graduate and undergraduate students. Subject matter and method of presentation vary from semester to semester. Fall and spring, 1980-81.
Prerequisite: Permission of instructor.

598. Research Problem **(1-3)**
Independent study of selected areas of environmental interest. Emphasis on a self-disciplined study, development of procedures and techniques to be employed in environmental design and planning. Engagement with specific sites and problems as proposed for study by individual communities. Enrollment at periodic intervals throughout the semester. Fall and Spring, 1980-81.
Prerequisite: Permission of the instructor.

620. Graduate Studio I **(4)**
Six hours of studio and two lecture and seminar hours per week. An examination and evaluation of the landscape architectural design process with an emphasis on the methodological variations which occur in its definition and application. A variety of projects, scales, and programs are employed as a vehicle for study of the design process. Fall, 1980.
Prerequisite: Permission of the instructor.

650. Determinants of Urban/Regional Land Use Patterns **(3)**
Three hours of discussion. This course will provide an introduction to social science theories of urban and regional land use patterns. The nature of social, economic, and political processes are explored in order to determine how the relationship of such factors affects the spatial development of the urban and regional environment. Understanding of these processes provides a basis for urban and regional planning. Fall, 1980.
Prerequisite: Permission of the instructor.

651. Process of Urban/Regional Planning **(3)**
Three hours of seminar. The purpose of this course is the introduction of planning as a process of decisionmaking and to familiarize graduate students with its scope and content. The course relies upon lectures and readings to develop introductory knowledge as well as seminars and discussions to cover the constitutional basis, tools, and techniques and the current directions of planning. Spring, 1981.
Prerequisite: Permission of the instructor.

653. Environmental Land Use Planning (3)
An introduction to the interdisciplinary techniques and emphasis on environmental land use planning. Consideration of the underlying ecological and planning philosophies. Readings and discussions are used in order to familiarize students with the disciplines involved and the process of data analysis, synthesis, and plan formulation. Case studies and research projects used to enhance understanding. Fall and Spring, 1980-81.
Prerequisite: Permission of the instructor.

654. Urban/Regional Open Space Planning (3)
Three hours of seminar. An introduction of concepts of open space planning related to urban, suburban, new town, and regional land use. An investigation of contemporary methods for open space preservation through private and municipal efforts will include inventory and analysis techniques for identifying community needs and physical resources. Fall, 1980.
Prerequisite: Permission of the instructor.

655. Public Policy and the Urban Environment (3)
Three hours of seminar. This course investigates public policy decisions as they affect the physical and social patterns of the environment. Seminar discussions based on readings and case study investigation. Spring, 1981.
Prerequisite: Permission of the instructor.

696. Special Topics in Landscape Architecture (1-3)
Experimental or special coursework in landscape architecture for graduate and undergraduate students. Subject matter and method of presentation vary from semester to semester. Fall and spring, 1980-81.
Prerequisite: Permission of instructor.

697. Seminar—Topics and Issues of Physical Environment (2)
Current topics for discussion are selected in order to acquaint the entering graduate student with a generalized view of the issues of the physical environment. Fall, 1980.
Prerequisite: Permission of the instructor.

699. Research Methods and Techniques (3)
Three hours of lecture. The course examines the design and development of research problems pertinent to landscape architecture and environmental planning. The course will concentrate on three major areas: (1) Areas of Potential Research, (2) Research Methods and Techniques, and (3) Proposal Writing. A variety of approaches to research in human-environment interactions will be discussed and explored with reference to their relevance and applicability to graduate research. Spring, 1981.
Prerequisite: Permission of the instructor.

711. Human Behavior and Environmental Form (3)
Consideration of the nature and dynamics of people's movements in space as clues to their relationship with their environments. An examination of the basic social and behavioral concepts that relate to the human use of the urban environment. Concepts such as behavior patterns, territoriality, cognitive mapping, urban images, preference, neighborhood and community will be explored within the framework of "social space." The implications of such behavioral studies in the design of the environment will be considered. Fall and Spring, 1980-81.
Prerequisite: Permission of the instructor.

720. Graduate Studio II (4)
Six hours of studio and two hours of lecture and seminar. An examination of the significance of behavioral research to landscape architectural design. The interrelationship between the design process as a professional approach and the techniques employed in the behavioral sciences will be examined. Application of design process and behavioral science techniques to a variety of projects will be explored in order to develop solutions supportive of human behavior. Spring, 1981.
Prerequisite: LSA 620 or permission of the instructor.

721. Graduate Studio III **(4)**
Six hours of studio and two hours of lecture and seminar. An examination of the significance of natural sciences to design in landscape architecture. The interrelationship between landscape architectural design and current findings concerning the tolerances of the natural environment to alteration. Students are responsible for developing the organization, administration, and management of assigned projects. Fall, 1980.
Prerequisite: LSA 720 or permission of the instructor.

731. Plant Materials **(3)**
Seminars, individual conferences, field trips, readings. Guided individual study in aspects of plant materials related to landscape architecture. Fall or Spring, 1980-81.
Prerequisite: Permission of the instructor.

740. Landscape Architectural Construction **(3)**
Lectures, drafting. Detailed study of special landscape construction problems. Preparation of estimates, contracts, and specifications. Fall, 1980.
Prerequisite: Permission of the instructor.

752. Urban and Regional System Dynamics **(3)**
Lectures and workshop. The major concerns of this course are application of system dynamics; basic principles of system dynamics; and system dynamics modeling. This method is investigated as a useful tool in modeling many landscape architectural and planning problems. No prior computer experience is necessary. Fall, 1980.
Prerequisite: Permission of the instructor.

757. Methods of Corridor Location **(3)**
Three hours of lecture. This course emphasizes study of corridor types, traditional economic determinism, and the emergence of environmental, aesthetic, and social concerns. Landscape architectural methods for corridor location and evaluation are reviewed and compared. These methods include graphic overlays, an automated data bank, unified scoring systems, and multiple accounts. Students will engage a course project. Spring, 1981.
Prerequisite: Permission of the instructor.

796. Special Topics in Landscape Architecture **(1-3)**
One to three hours of class meetings. Special topics of current interest to graduate students in landscape architecture and related fields. A detailed course subject description will be presented as a topic area is identified and developed. Fall and Spring, 1980-81.
Prerequisite: Permission of the instructor.

797. Seminar **(2)**
Two hours of seminar. Discussion of current topics, trends, and, research related to landscape architecture, planning, and management. Fall and Spring, 1980-81.
Prerequisite: Permission of the instructor.

798. Research Problem
(Credit hours to be arranged according to nature of problem)
Special study of assigned problems relating to landscape architecture or planning, with emphasis on critical thinking. Fall and Spring, 1980-81.
Prerequisite: Permission of the instructor.

799. Thesis Project Proposal Development **(1)**
One hour of lecture and workshop. During this course, a student will prepare a proposal for a thesis/project in the MLA program. Fall, 1980.
Prerequisites: LSA 699 and permission of the instructor.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1980-81.

PSE—PAPER SCIENCE AND ENGINEERING

300. Introduction to Papermaking (3)
Three hours of lecture. Historical and commercial consideration of the paper industry. Technology of papermaking with emphasis on stock furnish, stock preparation and paper machine operation. Introductory discussions of papermaking materials and formation and reactions of a fibrous web. Fall, 1980.

301. Pulp and Paper Processes (3)
Three hours of lecture. Technological consideration of pulping and bleaching of woody raw material. Includes consideration of wood procurement and preparation, pulping and bleaching processes, recovery of secondary fibers, pollution abatement and other ancillary operations. Spring, 1981.
Prerequisites: FCH 475 and 476, PSE 300 (or concurrent).

302. Pulp and Paper Processes Laboratory (1)
One three-hour laboratory. Study and practice in the techniques of laboratory procedures normally encountered in the pulp and paper industry. Laboratory exercises selecting and using standard testing methods. Field trips to observe commercial equipment of the pulp and paper industry. Spring, 1981.
Prerequisite: PSE 301 (or concurrent).

304. Mill Experience (2)
Twelve weeks full-time pulp or paper mill employment approved by the Department between the junior and senior years. The student must submit a comprehensive report to fulfill this requirement. An adaptability rating chart furnished by the Department is prepared by the mill for each student employed. Summer, 1981.

370. Principles of Mass and Energy Balance (3)
Three hours of lecture. Study of the properties of steam and solving problems connected with material and energy balances. Fall, 1980.
Prerequisites: Calculus, physics, and CHE 346 (or concurrent).

371. Fluid Mechanics (3)
Three hours of lecture and/or demonstration. The study of momentum transfer. Flow of liquids and gases in pipelines, ducts and open channels. Newtonian and non-Newtonian flow. Pulp and blower characteristics and selection. Flow measurements and flow system design with economic considerations. Fall, 1980.
Prerequisites: Calculus and physics.

372. Heat Transfer (2)
Two hours of lecture and/or demonstration. The study of heat transfer including conduction, convection, radiation and their applications in industry. Heater and heat exchanger design and selection, and industrial evaporation. Spring, 1981.
Prerequisites: PSE 370 and 371 or equivalent.

461. Pulping Technology (3)
One hour of lecture and six hours of laboratory. Discussion of pulping and bleaching processes: effect of chemical and physical variables on the wood components and pulp properties; chemistry involved. Experiments in pulping and bleaching, and pulp evaluation. Fall, 1980.
Prerequisites: PSE 301, CHE 346 and CHE 356.
Note: A student may not enroll in or receive credit for both PSE 461 and ERE 671.

465. Paper Properties (4)
Three hours of lecture, three hours of laboratory and discussion. Evaluation and study of the physical, optical, and chemical properties of paper and the interrelationships existing between

paper manufacturing methods, papermaking additives, test results and the ultimate properties desired in the finished paper. Fall, 1980.

Prerequisites: PSE 301 and PSE 302.

Note: A student may not enroll in or receive credit for both PSE 465 and ERE 677.

466. Paper Coating and Converting **(2)**

One hour of lecture and three hours of laboratory. Evaluation and study of various coating materials and processes used by the paper industry. Introduction to polymers and their use in converting operations. Study of materials and equipment used in converting operations, fundamentals and parameters which control their use, effects on final properties of papers. Spring, 1981.

Prerequisite: PSE 465.

Note: A student may not enroll in or receive credit for both PSE 466 and ERE 678.

468. Papermaking Processes **(3)**

One hour of lecture and six hours of laboratory. Laboratory study of the papermaking process, with emphasis on operation of the semicommercial Fourdrinier paper machine. Emphasis is on the fundamentals of stock preparation, paper machine operation, evaluation of the finished product and the collection and analysis of data to develop material and energy balance. Results of each paper machine run are evaluated in seminar-type discussions. Spring, 1981.

Prerequisites: PSE 461 and PSE 465.

473. Mass Transfer **(3)**

Three hours of lecture. The study of mass transfer, humidification, air conditioning, drying, gas absorption, distillation, leaching, washing, and extraction. Fall, 1980.

Prerequisites: PSE 370, 371, and 372 or equivalent.

491. Paper Science and Engineering Project I **(1)**

Student makes a systematic survey of all available literature on the problem assigned him and incorporates it in a formal, typewritten report. An essential part of this report is a detailed outline of a research project which the student proposes to undertake during the next semester (PSE 492). Fall, 1980.

Prerequisites: PSE 300 and PSE 301.

492. Paper Science and Engineering Project II **(3)**

The analysis of a problem, the synthesis of a solution and the basic design of the facilities needed to solve a problem. Laboratory research, field work, and consulting as needed in addition to the literature survey completed in PSE 491. Progress reports and a final report and seminar-style presentation. Spring, 1981.

Prerequisite: PSE 491.

496. Special Topics **(1-3)**

Lectures, conferences, and discussions. Specialized topics in chemistry, chemical engineering, and physics as well as topics pertaining to management as related to the pulp, paper, paperboard, and allied industries. Fall and Spring, 1980-81.

498. Research Problem **(1-4)**

The student is assigned a research problem in pulping, bleaching, refining, additives, quality control of paper or paper products, or chemical engineering. The student must make a systematic survey of available literature on the assigned problem. Emphasis is on application of correct research technique rather than on the results of commercial importance. The information obtained from the literature survey, along with the data developed as a result of the investigation, is to be presented as a technical report. Fall and Spring, 1980-81.

Prerequisites: PSE 461 and PSE 465.

RMP—RESOURCE MANAGEMENT AND POLICY

587. Environmental Law **(3)**
Three hours of lecture and discussion. Studies in Environmental Law designed for resource managers. Review of structure and processes of American legal system, constitutional framework of environmental law, The National Environmental Policy Act, legal framework for management of federal lands, focus on legal aspects of common property resource management, land, water, and air. Fall or Spring, 1980-81.

588. The Law of Natural Resource Administration **(3)**
Three hours of lecture and discussion. An introduction to the law concerning the procedures, powers, and judicial review of public agencies responsible for the management of natural resources. Topics will include the extent of an agency's rule-making power and the rights of aggrieved parties to appeal from agency decisions. Spring, 1981.
Prerequisite: FOR 360 or equivalent course in public administration.

601. Resource Management Systems **(3)**
Three hours of lecture and seminar. Review of the structure and operation of the ecological and social environment within which resource managers operate. Major characteristics of the ecological utilization and control systems for forest and related natural resources are described and compared. Fall, 1980.

602. Resource Economics **(3)**
Three hours of lecture and discussion. Economic theory and analysis in resource management and use decisions. Study and application of economic models to land, water, forest, wildlife, and recreational resources. Relationships and interactions of public and private sector in resource management. Fall, 1980.
Prerequisite: Two semesters of undergraduate economics.

603. Research Methods in Resource Management and Policy **(3)**
Three hours of lecture and discussion. Study of the elements of research methodology including statistics and their application to analyzing and resolving problems both basic and applied in the managerial and policy sciences. Fall, 1980.
Prerequisite: Undergraduate statistics course.

606. Management Principles and Processes **(3)**
Three hours of lecture and group discussion. The central focus of this course is on decision-making, organization, and information theories as they relate to the total management process. Spring, 1981.
Prerequisite: Basic understanding of management functions and processes as found in FOR 360.

611. Economics of the Forest Business **(3)**
Two hours of lecture, three hours of laboratory. Economic evaluation of alternative uses of land, labor, and capital in the operation of forest properties and related marketing and processing enterprises. Emphasis is on application of principles and methods of economic analysis. Part of the term is spent in appraising a forest property and preparing a plan for its operation. Complementary to instruction in FOR 456. Spring, 1981.
Prerequisite: Permission of the instructor.

629. Environmental Impact: Principles and Strategies **(3)**
Three hours of lecture and discussion. Principles and theory of environmental impact and statements of impact as required by federal law. Administrative procedures for review and evaluation. Procedural strategy and effective constitution of statements for various governmental levels. Means of obtaining sources of authoritative information. Fall and Spring, 1980-81.

642. Water Quality Management (3)
Three hours of lecture and seminar. The review of the ethical, historical, legal, and technical basis for water quality management. Investigation of public policy on the international, federal, state, and local levels and the administrative methods and programs used to implement policy. Fall, 1980.

643. Urban Water Management (3)
Three hours of lecture and seminar. A review of the role of urban water management in water resources management. The problems and issues of providing water utilities services of water supply, drainage, and waste water facilities including such considerations as planning, financing, local government, intergovernmental relations, state and federal role, water institutions and applicable law. Spring, 1981.

650. Forestry and Economic Development (3)
Three hours of lecture and discussion. Study of the role of forest resources in the process of economic development. Characteristics of forest resources which are important for economic development are analyzed in detail. Interrelationships between biological, technological, and institutional factors are stressed. Fall, 1980.

662. Land Use Economics (3)
Three hours of lecture and discussion. Study of the theory and methods of land use economics and the application of economic analysis to open space and regional planning. Emphasis is on understanding basic concepts, developing of operational methods and data sources. Case studies, outside readings, and guest speakers are utilized. Fall, 1980.
Prerequisites: One course in macroeconomics and one in microeconomics and permission of the instructor.

664. Soil and Water Conservation (3)
Three hours of lecture and discussion. An integrated examination of the many aspects of the field of water and related land resource conservation in the United States. Topics include the evaluation and present status of planning, organizational, economic and legal constraints on the development of policies and programs of the federal agencies, state and local government and private units. Fall, 1980.
Prerequisite: Permission of the instructor.

670. Economics of Nonmarket Goods (3)
Group discussion, lectures, guided readings, case studies, and student projects on the economic aspects of watershed management, fish and wildlife management, and outdoor recreation. Major topics include theories of valuation and application to nonmarket goods, cost analysis for nonmarket goods, and measurement of regional impacts. Spring, 1981.
Prerequisites: FOR 206 or equivalent, knowledge of basic statistical analysis, and six hours or more of resource management coursework.

672. Open Space Planning (Recreation) (3)
Three hours of lecture and discussion. Study of methods and techniques applicable to open space planning in nonurban areas. Survey of literature and current research. Open space standards, classification systems, and inventory methods. Development of plans for large scale recreation areas, and inclusion of recreation into regional plans. The interrelationship and conflicts between resource utilization/development and recreation/aesthetics reviewed through case studies. Fall, 1980.
Prerequisites: One course in outdoor recreation, one course in planning, and permission of the instructor.

675. Psychology of Leisure Behavior (3)
Three hours of lecture and discussion. Introduction to theory and research findings dealing with the sociological and psychological aspects of leisure behavior: field work and lectures demonstrate applications, particularly in outdoor recreation. Spring, 1981.

751. World Forestry **(3)**
Three hours of lecture and discussion. World forest distribution and types; regional production and consumption of forest products; international trade in timber and related products; the role of forest resources in development; and special topics; tropical forestry, comparative forest policies and programs, forestry education, the problems of developing countries, international cooperation in forestry development, the role of the United States in world forestry, etc. Fall or Spring, 1980-81.

753. Resources Policy **(3)**
Three hours of lecture and seminar. Evaluation of basic environmental and resource issues and their evolvement in public and institutional policies. Exploration of alternative resource goals, policies, and program approaches and their implications. Analysis of processes for policy delineation and modification. Spring, 1981.

754. Advanced Forest Administration **(3)**
Critical appraisal of existing public, semipublic and private forestry agencies in the United States, and the comparative study of major administrative organizations and practices. Occasional inspection trips to forestry headquarters and field units and discussion of internal administrative problems with forest officers. Fall or Spring, 1980-81.
Prerequisite: FOR 360 or equivalent.

797. Seminar **(1)**
Group discussion and individual conference concerning current topics, trends, and research in management. Fall and Spring, 1980-81.

798. Research Problems in Resources Management and Policy
(Credit hours arranged according to nature of problem)
Special investigation and analysis of resources management problems where integrative relationships of several subject aspects of forestry are a major consideration. Fall and Spring, 1980-81.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1980-81.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1980-81.

SCE—SCHOOL OF CONTINUING EDUCATION

510. Creative Problem Solving Seminar **(3)**
Three hours of lecture and discussion. A course designed to extend the students' understanding and application of creative problem solving processes. One requirement will be to select and carry out an application of the techniques to a particular problem, with consultation and guidance from the instructor. Critique and survey of the literature on creativity, in-depth anaylsis of the synetics process and various procedures which have been developed for nurturing creative behavior comprise the essence of the program. Fall, 1980.
Prerequisite: Undergraduate degree or permission of the instructor.
Note: Also listed as EIN 510.

530. (FEN) Pest Identification, Biology and Management **(3)**
A study of the life history and management practices for pests common to the home, landscape and recreational areas. Suggested for pest control personnel and teachers of primary and secondary science areas. Not open to College of Environmental Science and Forestry students. Summer, 1981.
Prerequisite: One course in biology.

576. Special Topics Course: Environmental Education Processes and Strategies (3)
Lectures, discussions, field problems, and structured outdoor laboratory assignments in environmental education processes and strategies for professional educators in elementary and secondary schools who are part-time, nonmatriculated at ESF. Summer, 1981.
Prerequisite: Permission of the instructor. Not acceptable for credit in graduate programs of the School of Forestry.

596. Special Topics in Resource Management (1-3)
Lectures, field exercises, guided readings and discussions, in a shortcourse format. The study of recent developments and applications in resource management. Illustrative topics include management of forest stands, resource economics, land planning or recreation planning and site development. Not acceptable for credit in graduate programs of the School of Forestry. Summer, 1981.
Prerequisite: Permission of the instructor.

SIL—SILVICULTURE

520. Application of Ecology (3)
Two hours of lecture and discussion and one to three hours seminar, workshop, or field trip. Exploration of use and implications of ecological concepts for practices modifying terrestrial ecosystems for human benefit. Discussion of ecological writings in relation to applied problems; workshops, field trips and student presentations exploring ecological implications of specific situations. Course designed for interdisciplinary participation. Spring, 1981.
Prerequisite: An ecology course or permission of the instructor.

553. Energy Exchange at the Earth's Surface (3)
Two hours of lecture and three hours of laboratory. A comprehensive study of the physical processes taking place in the lowest layer of the atmosphere. Primary emphasis on the turbulent transfer of heat, momentum, and water vapor and the expression of these fluxes in the microclimate. Spring, 1981.
Prerequisites: FOR 452, physics, and calculus.

625. Productivity of Forest Stands (3)
Examination of forest tree and stand production variables as related to silvicultural manipulation. Analysis of stand response, such as rate of growth, stem form, product quality, tree quality, and value. Preparation of stand treatment schedules. Spring, 1981.
Prerequisite: Permission of the instructor.

635. Forest Soils and Their Analyses (3)
One hour of lecture, one hour of recitation, four hours of field and laboratory study of forest soils, emphasizing plant-soil relationships. Stress on quantification of plant-soil diagnostic techniques and their interpretation. Fall, 1980.
Prerequisites: FOR 446; background in physical and biological sciences recommended.

640. Advanced Wildland Hydrology (3)
Lecture, discussion, and laboratory sessions in advanced problems of forest and range hydrology, watershed management methods, and techniques and evaluation of new methods of hydrologic data collection and analysis. Fall, 1980.
Prerequisite: FOR 440 or FEG 340.

641. Watershed Analysis (3)
One hour of lecture and six hours of laboratory. Lecture and field experience in watershed characterization, inventory, and analysis in terms of land management problems. Fall, 1980.
Prerequisites: FOR 440 and permission of the instructor.

642. Snow Hydrology (3)
Three one-hour lectures and two three-day field trips. Physical characteristics of snow and the energy relations important in its accumulation and dissipation. Problems of measurement and prediction of runoff and melt. Potentials for management. Spring, 1981.
Prerequisite: FOR 440 or FEG 340.

677. Advanced Forest Tree Improvement (3)
Two hours of lecture and discussion and three hours of laboratory. A study of advanced principles and techniques for genetic improvement of forest trees. Special emphasis is placed on selection and breeding for growth rates, wood quality, and insect and disease resistance. Problems of tree hybridization, racial variations, sexual reproduction, and quantitative genetics in forest trees. Laboratory training in cytology and cytogenetics, pollen germination, vegetative propagation and other problems. Independent research problems will be undertaken by the student. Fall or Spring, 1980-81.
Prerequisites: FBL 470 and 471, FOR 455.

730. Research Methods in Silviculture (3)
Three hours of lecture or discussion. Research concepts and methodology with particular application to silviculture and its related sciences. More appropriate to beginning students or before taking thesis work. Fall, 1980.
Prerequisite: Permission of the instructor.

735. Forest Soil Fertility (Applied Studies) (2-4)
Two hours of lecture and one hour of discussion. Up to six hours of laboratory depending on number of credit hours. Influence of soil fertility on development and growth of seedlings and trees, and techniques involved to determine this influence. Chemical and biological analysis to determine levels of soil fertility. Nutrient element deficiencies and their correction by soil amendments and fertilizers. Term projects by the student will be undertaken. Spring, 1981.
Prerequisites: CHE 332 and 333, FBO 530, FOR 446 and SIL 635, or equivalent.

737. Forest Soil Physics (4)
Three hours of lecture and discussion and three hours of laboratory. Presentation of principles of soil physics including water flow, storage and availability, soil permeability, heat transfer, and their consideration as root environmental factors. Analytical procedures are introduced and evaluated. Applications of soil physics to silvics, soil fertility, watershed management and hydrology, soil biology and land-use. Spring, 1981.
Prerequisites: FOR 345, 446, or their equivalents. Physical chemistry and integral calculus strongly recommended.

777. Quantitative Genetics in Forest Tree Improvement (3)
Two-hour lecture and discussion and three hours laboratory. Development of statistical models for determining heritability in forest trees. Breeding models and computer analysis application in forest genetics. Fall or Spring, 1980-81.

796. Special Topics in Silviculture (1-3)
Lectures, seminars, and discussion. Advanced topics in silviculture. Check schedules of classes for details of subject matter. Fall and/or Spring, 1980-81.

797. Graduate Silviculture Seminar (1)
Three-hour class discussion. Assigned reports and discussion of silvicultural topics. Fall and Spring, 1980-81.

798. Research Problems in Silviculture
(Credit hours arranged according to nature of problem)
Fall and Spring, 1980-81.

899. Master's Thesis Research (Credit hours to be arranged)
Research and independent study for the master's degree and thesis. Fall and Spring, 1980-81.

999. Doctoral Thesis Research (Credit hours to be arranged)
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1980-81.

WPE—WOOD PRODUCTS ENGINEERING

300. Properties of Wood for Designers **(2)**
Two hours of lecture. An introduction to the basic structure and properties of wood for the designer. Discussion of the effects of wood structure and properties on practical woodworking techniques. Fall and Spring, 1980-81.

320. Polymeric Adhesives and Coatings **(2)**
Two hours of lecture. An introduction to organic adhesives and coatings for the purpose of being able to specify proper materials for particular applications. Knowledge acquired will allow the individual to understand product literature and specifications. Wood product systems are discussed in detail, but the principles involved are easily transferred to other substrate systems. A knowledge of chemistry is not required. Spring, 1981.

321. Adhesives and Coatings Laboratory **(1)**
Three hours of laboratory. Laboratory experiments to identify materials, methods of application and methods of evaluation of adhesives and coatings normally used in the wood industry. Spring, 1981.
Prerequisite: WPE 320 (or concurrent) or permission of the instructor.

322. Mechanical Processing **(3)**
Two hours of lecture and three hours of laboratory. Primary log reduction methods and industry practices. Lumber grading. Wood cutting principles. Machining practice in secondary wood-using industries. Experience in the operation of certain primary and secondary machining equipment. Fall, 1980.

326. Fluid Treatments **(2)**
Two hours of lecture. An introduction to wood-moisture relationships, wood permeability and pressure treatments, thermal conductivity, water-vapor movement, and drying and fire retardancy. The flow of fluids, heat and water vapor are treated as analogous phenomena and are related to the cellular structure of wood. Unsteady-state flow of gases, heat and water vapor are introduced. Spring, 1981.

327. Fluid Treatments Laboratory **(1)**
Three hours of laboratory. Laboratory studies in relative humidity measurement, wood-moisture relationships, the relationship between permeability and treatability, wood-preservative treatments, wood drying and flame testing. Spring, 1981.
Prerequisite: WPE 326 (or concurrent).

343. Introduction to Structural Design **(3)**
Three hours of lecture. The concepts of structural design are introduced with fundamental strength of materials. There are practical applications of steel, timber, and concrete in contemporary structural designs. Systems such as trusses, arches, and frames are introduced. Spring, 1981.

387. Wood Structure and Properties **(3)**
Three hours of lecture. Structure of wood and its relation to physical properties and uses. The normal variability of wood, abnormal growth, defects, deterioration of wood and their influence on properties and uses. Fall, 1980.
Prerequisite: FBO 300 or equivalent is recommended.

388. Wood and Fiber Identification Laboratory **(2)**
Six hours of laboratory. Wood and papermaking fiber identification using both gross and microscopic features. Fall, 1980.
Prerequisite: WPE 387 (or concurrent).

389. Wood Identification Laboratory **(1)**
Three hours of laboratory. Identification of principal commercial timbers of United States on gross characteristics. Spring, 1981.
Prerequisite: WPE 387.

390. Field Trip **(2)**
Two weeks supervised study and reporting of representative wood products industries. Required of all students in WPE. Estimated individual expenses are $200-250 while on the trip. Summer, 1981.

400. Introduction to Forest Products **(2)**
Two hours of lecture. Characteristics of the products of the forest tree and manufacture of wood products. Fall or Spring, 1980-81.

404. Design of Wood Structural Elements **(3)**
Lectures plus laboratory exercises. A development of the principles involved in designing structural elements in wood and practice in their application. Fall or Spring, 1980-81.
Prerequisite: ERE 362.

422. Composite Materials **(3)**
Two hours of lecture and three hours of laboratory. Manufacturing methods and physical properties of wood laminates, fiberboard, particleboard, plywood, paper overlays, sandwich materials, wood-polymer composites and extruded and molded products. Fall, 1980.
Prerequisites: WPE 320 and WPE 326. Concurrent or prior registration in ERE 362.

442. Light Construction **(3)**
Two hours of lecture, two hours of discussion, problems and practice. Elements of light frame construction, blue print reading and estimating. Fall and Spring, 1980-81.

444. Materials Marketing **(3)**
Three hours of lecture and discussion. Marketing functions, agencies and management in the wood products and related industries. Principles of salesmanship and their application. Spring, 1981.

450. Construction Equipment **(3)**
Three hours of lecture. Principles of selection, operation, and maintenance of construction equipment. Primary types of site preparation, handling and assembly devices and their efficient utilization will be examined. Spring, 1981.
Prerequisite: Senior standing.

454. Construction Management **(3)**
Three hours of lecture. Fundamental concepts of construction management activities. Topics include construction contracts, scheduling, project planning, estimating and bidding. Spring, 1981.
Prerequisite: OPM 365 or permission of instructor.

497. Senior Seminar for Wood Products Engineering Majors **(2)**
Discussion and assigned reports in current problems and new developments in Wood Products Engineering. Fall, 1980.

498. Research or Design Problem **(1-3)**
Conferences, library, laboratory and/or field research on a specific problem in Wood Products Engineering. Typewritten report (original and one copy) required. Fall and/or Spring, 1980-81.
Prerequisite: Permission of the instructor.

State University of New York

State University's 64 geographically dispersed campuses bring educational opportunity within commuting distance of virtually all New York citizens and comprise the nation's largest, centrally managed system of public higher education.

When founded in 1948, the University consolidated 29 State-operated, but unaffiliated, institutions. In response to need, the University has grown to a point where its impact is felt educationally, culturally, and economically the length and breadth of the State.

More than 340,000 students are pursuing traditional study in classrooms or are working at home, at their own pace, through such innovative institutions as Empire State College, whose students follow individualized and often nontraditional paths to a degree. Of the total enrollment, more than 100,000 students are 24 years or older, reflecting State University's services to specific constituencies, such as refresher courses for the professional community, continuing educational opportunities for returning servicemen, and personal enrichment for the more mature persons.

State University's research contributions are helping to solve some of modern society's most urgent problems. It was a State University scientist who first warned the world of potentially harmful mercury deposits in canned fish, and another who made the connection between automobile and industrial smoke combining to cause

changes in weather patterns. Other University researchers continue important studies in such wide-ranging areas as immunology, marine biology, sickle-cell anemia, and organ transplantation.

More than 1,000 Public Service activities are currently being pursued on State University campuses. Examples of these efforts include: special training courses for local government personnel, State civil service personnel, and the unemployed; participation by campus personnel in joint community planning or project work, and campus-community arrangements for community use of campus facilities.

A distinguished faculty includes nationally and internationally recognized figures in all the major disciplines. Their efforts are recognized each year in the form of such prestigious awards as Fulbright-Hayes, Guggenheim and Danforth Fellowships.

The University offers a wide diversity of what are considered the more conventional career fields, such as engineering, medicine, literature, dairy farming, medical technology, accounting, social work, forestry, and automotive technology. Additionally, its responsiveness to progress in all areas of learning and to tomorrow's developing societal needs has resulted in concentrations which include pollution, urban studies, computer science, immunology, preservation of national resources, and microbiology.

SUNY programs for the educationally and economically disadvantaged have become models for delivering better learning opportunities to a once-forgotten segment of society. Educational Opportunity Centers offer high school equivalency and college preparatory courses to provide young people and adults with the opportunity to begin college or to learn marketable skills. In addition, campus based Educational Opportunity Programs provide counseling, developmental education and financial aid to disadvantaged students in traditional degree programs.

Overall, at its EOC's, two-year colleges, four-year campuses and university and medical centers, the University offers 3,600 academic programs. Degree opportunities range from two-year associate programs to doctoral studies offered at 12 senior campuses.

The 30 two-year community colleges operating under the program of State University play a unique role in the expansion of educational opportunity, by:

Providing local industry with trained technicians in a wide variety of occupational curricula;

Providing transfer options to students who wish to go on and earn advanced degrees, and;

Providing the community with yet another source for technical and professional upgrading as well as personal enrichment.

During its brief history, State University has graduated more than 650,000 alumni, the majority of whom are pursuing their careers in communities across the State.

State University is governed by a Board of Trustees, appointed by the Governor, which directly determines the policies to be followed by the 34 State-supported campuses. Community colleges have their own local boards of trustees whose relationship to the SUNY board is defined by law. The State contributes one-third to 40 percent of their operating cost and one-half of their capital costs.

The State University motto is: "To Learn—To Search—To Serve."

STATE UNIVERSITY OF NEW YORK

UNIVERSITY CENTERS

State University of New York at Albany
State University of New York at Binghamton
State University of New York at Buffalo
State University of New York at Stony Brook

COLLEGES OF ARTS AND SCIENCES

Empire State College
State University College at Brockport
State University College at Buffalo
State University College at Cortland
State University College at Fredonia
State University College at Geneseo
State University College at New Paltz
State University College at Old Westbury
State University College at Oneonta
State University College at Oswego
State University College at Plattsburgh
State University College at Potsdam
State University College at Purchase

COLLEGES AND CENTERS FOR THE HEALTH SCIENCES

Downstate Medical Center at Brooklyn
Upstate Medical Center at Syracuse
College of Optometry at New York City
Health Sciences Center at Buffalo University Center*
Health Sciences Center at Stony Brook University Center*

AGRICULTURAL AND TECHNICAL COLLEGES

Agricultural and Technical College at Alfred
Agricultural and Technical College at Canton
Agricultural and Technical College at Cobleskill
Agricultural and Technical College at Delhi
Agricultural and Technical College at Farmingdale
Agricultural and Technical College at Morrisville

SPECIALIZED COLLEGES

College of Environmental Science and Forestry at Syracuse
Maritime College at Fort Schuyler
College of Technology at Utica/Rome
Fashion Institute of Technology at New York City***

STATUTORY COLLEGES**

College of Agriculture and Life Sciences at Cornell University
College of Ceramics at Alfred University
College of Human Ecology at Cornell University
School of Industrial and Labor Relations at Cornell University
College of Veterinary Medicine at Cornell University

COMMUNITY COLLEGES

(Locally-sponsored, two-year colleges under the program of State University)

Adirondack Community College at Glens Falls
Broome Community College at Binghamton
Cayuga County Community College at Auburn
Clinton Community College at Plattsburgh
Columbia-Greene Community College at Hudson
Community College of the Finger Lakes at Canandaigua
Corning Community College at Corning
Dutchess Community College at Poughkeepsie
Erie Community College at Williamsville, Buffalo and Orchard Park
Fashion Institute of Technology at New York City
Fulton-Montgomery Community College at Johnstown
Genesee Community College at Batavia
Herkimer County Community College at Herkimer
Hudson Valley Community College at Troy
Jamestown Community College at Jamestown
Jefferson Community College at Watertown
Mohawk Valley Community College at Utica
Monroe Community College at Rochester
Nassau Community College at Garden City
Niagara County Community College at Sanborn
North Country Community College at Saranac Lake
Onondaga Community College at Syracuse
Orange County Community College at Middletown
Rockland Community College at Suffern
Schenectady County Community College at Schenectady
Suffolk County Community College at Selden, Riverhead and Brentwood
Sullivan County Community College at Loch Sheldrake
Tompkins Cortland Community College at Dryden
Ulster County Community College at Stone Ridge
Westchester Community College at Valhalla

*The Health Sciences Centers at Buffalo and Stony Brook are operated under the administration of their respective University Centers.
**These operate as "contract colleges" on the campuses of independent universities.
***While authorized to offer such baccalaureate and master's degree programs as may be approved pursuant to the provisions of the Master Plan, in addition to the associate degree, the Fashion Institute of Technology is financed and administered in the manner provided for community colleges.

College of Environmental Science and Forestry

ESF BOARD OF TRUSTEES

COLLEGE ADMINISTRATION

President .... EDWARD E. PALMER
Assistant to the President .... JENIFER BREYER
Assistant to the President for Community Relations .... ROLLA W. COCHRAN

Vice President for Program Affairs .... DONALD F. BEHREND
Assistant Vice President for Research Programs .... JAMES W. GEIS
Assistant Vice President for Academic Programs .... ROBERT H. FREY
Coordinator of Sponsored Programs .... J. DONALD MABIE
Director of Admissions .... ROBERT L. FRIEDMAN
Director, Institute of Environmental Program Affairs (IEPA) .... JAMES W. GEIS
Coordinator of Demonstration and Information, IEPA .... ROLLA W. COCHRAN

Vice President for Student Affairs .... HARRISON H. PAYNE
Director of Financial Aids .... JOHN E. VIEW
Registrar .... ROBERT S. NORTH
Adjunct Foreign Student Counselor .... VIRGINIA T. TORELLI

Vice President for Administration and Services .... DAVID G. ANDERSON
Assistant to the Vice President .... JUDITH A. LAMANNA
Director of Business and Fiscal Affairs .... HARRY J. CORR
Librarian .... DONALD F. WEBSTER
Director of Educational Communications .... BERNARD T. HOLTMAN
Director of Computer Services .... CHARLES N. LEE
Director of Personnel and Affirmative Action .... JOHN S. FORSTER
Director of Physical Plant .... BRUCE E. REICHEL
Director of Campus Safety and Security .... BRIAN M. SPEER
Associate for Institutional Research .... RHONDDA K. CASSETTA
Director of Analytical and Technical Services .... JOHN A. MEYER
Affirmative Action Officer .... ALTON W. ZANDERS

Dean, School of Biology, Chemistry and Ecology .... STUART W. TANENBAUM
Dean, School of Continuing Education .... JOHN M. YAVORSKY
Dean, School of Environmental and Resource Engineering .... WILLIAM P. TULLY
Dean, School of Forestry .... JOHN V. BERGLUND
Dean, School of Landscape Architecture .... ROBERT G. REIMANN
Director, School of Forest Technology .... JAMES E. COUFAL
Director, Graduate Program in Environmental Science .... ROBERT D. HENNIGAN
Director, Adirondack Ecological Center .... WILLIAM C. TIERSON
Director, Empire State Paper Research Institute .... BENGT LEOPOLD
Acting Director, Polymer Research Institute .... KENNETH J. SMITH
Director, Ultrastructure Studies Center .... WILFRED A. CÔTÉ, JR.
Director, Tropical Timber Information Center .... ROBERT W. DAVIDSON
Director, Cellulose Research Institute .... TORE E. TIMELL
Project Leader, U.S. Forest Service Cooperative Research Unit . ROWAN A. ROWNTREE
Director, Renewable Materials Institute .... WILFRED A. CÔTÉ, JR.

COLLEGE FACULTY AND PROFESSIONAL STAFF

This listing represents an official record of the State University of New York College of Environmental Science and Forestry faculty and professional staff for 1980. It is designed for use in 1980-81.

The date in parentheses after each name denotes the first year of service, two or more dates, the term of service.

LAWRENCE P. ABRAHAMSON (1977), *Senior Research Associate*, School of Forestry and Department of Environmental and Forest Biology; B.S., Michigan Technical University, 1964; M.S., University of Wisconsin, 1967; Ph.D., University of Wisconsin, 1969

BONNIE I. ABRAMS (1977), *Technical Assistant*, Department of Environmental and Forest Biology; B.S., State University of New York College of Environmental Science and Forestry, 1977

JUDD H. ALEXANDER (1979), *Adjunct Professor*, Graduate Program in Environmental Science; B.A., Carleton College, 1949; P.M.D., Harvard Business School, 1967

MAURICE M. ALEXANDER (1949), *Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; *Director*, Roosevelt Wildlife Forest Experiment Station; B.S., New York State College of Forestry, 1940; M.S., University of Connecticut, 1942; Ph.D., State University of New York College of Forestry, 1950

DOUGLAS C. ALLEN (1968), *Associate Professor*, Department of Environmental and Forest Biology; B.S., University of Maine, 1962; M.S., 1965; Ph.D., University of Michigan, 1968

IRA H. AMES (1972), *Adjunct Associate Professor*, Department of Environmental and Forest Biology; B.A., Brooklyn College, 1959; M.S., New York University, 1962; Ph.D., 1966

DAVID G. ANDERSON (1959), *Vice President for Administration and Services; Professor*; A.A.S., State University of New York College of Forestry (Ranger School), 1950; B.S., State University of New York College of Forestry, 1953; M.S., University of Utah, 1958; M.P.A., Syracuse University, 1972

ROBERT E. ANTHONY (1953), *Technical Specialist*, Department of Environmental and Forest Biology; A.A.S., State University of New York Agricultural and Technical College at Morrisville, 1952

GEORGE R. ARMSTRONG (1950), *Professor*, School of Forestry; B.S., State University of New York College of Forestry, 1949; M.S., 1959; Ph.D., 1965

ROBERT W. ARSENEAU (1972), *Programmer/Analyst*, Administrative Data Processing; A.A.S., Mohawk Valley Community College, 1967; B.S., Syracuse University, 1978

JAMES P. BAMBACHT (1967), *Associate Professor*, Department of Paper Science and Engineering; A.B., Kalamazoo College, 1954; M.S., The Institute of Paper Chemistry, 1956; Ph.D., State University of New York College of Environmental Science and Forestry, 1973

C. ELLISON BECK (1970), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services

DONALD F. BEHREND (1960-67) (1968), *Vice President for Program Affairs*, Office of Program Affairs; *Professor*, Department of Environmental and Forest Biology; B.S., University of Connecticut, 1958; M.S., 1960; Ph.D., State University of New York College of Forestry, 1966

JOHN D. BENNETT (1960), *Associate Professor*, School of Forestry; Graduate Program in Environmental Science; B.A., Ohio Wesleyan University, 1954; Ph.D., Syracuse University, 1968; *Chancellor's Award for Excellence in Teaching* (1973)

JOHN V. BERGLUND (1965), *Dean and Professor*, School of Forestry; B.S., Pennsylvania State University, 1962; M.S., 1964; Ph.D., State University of New York College of Forestry, 1968

WILLIAM H. BETTINGER (1972), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services; A.A.S., Rochester Institute of Technology, 1955

DONALD H. BICKELHAUPT (1969), *Research Assistant*, School of Forestry; B.S., State University of New York College of Forestry, 1969; M.S., State University of New York College of Environmental Science and Forestry, 1979

PETER E. BLACK (1965), *Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., University of Michigan, 1956; M.F., 1958; Ph.D., Colorado State University, 1961; *Executive Chairman of the Faculty* (1974-76) (1976-78)

GARY BLISS (1972), *Technical Assistant*, Department of Environmental and Forest Biology; State University of New York College of Environmental Science and Forestry (Ranger School), 1972

WILLIAM R. BORGSTEDE (1971), *Technical Assistant*, Department of Environmental and Forest Biology; A.A.S., Miner Institute, 1966; A.A.S., State University of New York College at Delhi, 1970; B.S., State University of New York College of Environmental Science and Forestry, 1975, M.S.; Syracuse University, 1978

JENIFER BREYER (1979), *Assistant to the President*; B.A., University of Northern Iowa, 1964; M.A., Indiana University, 1970

JEROME BREZNER (1961), *Professor*, Department of Environmental and Forest Biology; A.B., University of Rochester, 1952; A.M., University of Missouri, 1956; Ph.D., 1959

KENNETH W. BRITT (1979), *Senior Research Associate*; Department of Paper Science and Engineering; B.Chem., Cornell University, 1929

ROBERT H. BROCK, JR. (1967), *Chairman and Professor*, Department of Forest Engineering; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1958; M.S., 1959; Ph.D., Cornell University, 1971

RANIER H. BROCKE (1969), *Senior Research Associate*, Adirondack Ecological Center; B.S., Michigan State University, 1955; M.S., 1957; Ph.D., 1970

DAVID F. BRODOWSKI (1977), *Technical Assistant*, Department of Environmental and Forest Biology; B.S., Cornell University, 1975

ALTON F. BROWN (1963), *Technical Specialist*, Empire State Paper Research Institute

THOMAS E. BROWN (1977), *Adjunct Assistant Professor*, Department of Environmental and Forest Biology; B.S., Niagara University, 1957; M.S., State University of New York College of Environmental Science and Forestry, 1968

KENNETH F. BURNS (1970), *Technical Assistant*, School of Forestry; A.A.S., Paul Smith's College, 1969

HARRY W. BURRY (1962), *Extension Specialist*, School of Forestry; *Associate Professor*; B.S., State University of New York College of Forestry, 1941; M.F., 1964

PAUL M. CALUWE (1969), *Associate Professor*, Department of Chemistry; *Associate Member*, Polymer Research Institute; Ph.D., University of Leuven, 1967

WILBUR H. CAMPBELL (1975), *Assistant Professor*, Department of Chemistry; A.A., Santa Ana College, 1965; B.A., Pomona College, 1967; Ph.D., University of Wisconsin, 1972

HUGH O. CANHAM (1966), *Associate Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1960; M.S., 1962; Ph.D., 1971

DIANNE M. CAPRITTA (1967), *Associate Librarian*, F. Franklin Moon Library; B.S., University of Illinois, 1965; M.S.L.S., Syracuse University, 1967

J. FREDERICK CASLICK (1980), *Research Assistant*, Graduate Program in Environmental Science; B.A., Ohio State University, 1970; M.S., State University of New York College of Environmental Science and Forestry, 1975; M.U.P., New York University, 1977

RHONDDA K. CASSETTA (1967), *Associate for Institutional Research*, Office of the Vice President for Administration and Services; A.B., Elmira College, 1933

COSTAS A. CASSIOS (1978), *Adjunct Professor*, Landscape Architecture; B.S., University of Thessaloniki, 1965; M.S., Graduate Industrial School, 1969; M.S., University of Wisconsin, 1972; Ph.D., 1976

JOHN D. CASTELLO (1978), *Assistant Professor*, Department of Environmental and Forest Biology; B.A., Montclair State College, 1973; M.S., Washington State University, 1975; Ph.D., University of Wisconsin, 1978

ROBERT E. CHAMBERS (1967), *Associate Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., Pennsylvania State University, 1954; M.S., 1956; Ph.D., Ohio State University, 1972

WILLIAM M. CHRISTIAN (1974), *Technical Assistant*, Department of Maintenance and Operations

NEILS B. CHRISTIANSEN (1960), *Senior Research Associate*; School of Forestry; B.S., University of Idaho, 1957; M.S., State University of New York College of Forestry, 1959; Ph.D., 1966

ROLLA W. COCHRAN (1964), *Assistant to the President for Community Relations*; Office of the President; *Associate Professor*; Coordinator of Demonstration and Information, Institute of Environmental Affairs; B.A., Denison University, 1949; M.S., Ohio State University, 1951

HARRY J. CORR (1967), *Director of Business and Fiscal Affairs*, Office of the Vice President for Administration and Services; B.S. Siena College, 1957

WILFRED A. CÔTÉ, JR. (1950), *Professor*, Department of Wood Products Engineering; Director, Renewable Materials Institute and N.C. Brown Center for Ultrastructure Studies; B.S., University of Maine, 1949; M.F., Duke University, 1950; Ph.D., State University of New York College of Forestry, 1958

JAMES E. COUFAL (1965), *Director and Professor*, School of Forest Technology; State University of New York College of Forestry (Ranger School), 1957; B.S., State University of New York College of Forestry, 1960; M.S., 1962; Ed.S., State University of New York at Albany, 1976

PHILLIP J. CRAUL (1968), *Professor*, School of Forestry; B.S.F., Pennsylvania State University, 1954; M.S., 1960; Ph.D., 1964

JAMES O. CREVELLING (1970), *Forest Property Manager*, Wanakena and Cranberry Campuses; A.A.S., Paul Smith's College, 1965; B.S., University of Massachusetts, 1967

SUSAN B. CRITCHELL (1979), *Assistant Librarian*, F. Franklin Moon Library; B.A., Marietta College, 1965; M.L.S., State University of New York at Albany, 1979

CLAY M. CROSBY (1964), *Research Assistant*, Empire State Paper Research Institute; B.S., State University of New York College of Forestry, 1964; M.S., 1970

SHEILA M. CROWLEY (1977), *Assistant for Institutional Research; Director of Administrative Data Processing*, Office of the Vice President for Administration and Services; A.B., Albertus Magnus College, 1967; M.S., Syracuse University, 1979

JUSTIN CULKOWSKI (1978), *Director of Alumni Affairs*, B.S., State University of New York College of Environmental Science and Forestry, 1973

TIBERIUS CUNIA (1968), *Professor*, School of Forestry; Graduate Program in Environmental Science; Forest Engineer, Ecole Nat. des Eaux et Forets, 1951; M.S., McGill University, 1957

GEORGE W. CURRY (1966), *Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.A., Michigan State University, 1962; B.S., 1965; M.L.A., University of Illinois, 1969

MIROSLAW M. CZAPOWSKYJ (1979), *Adjunct Professor*, School of Forestry; Diplomforstwirt, Ludwig-Maximiliams University, 1949; M.S., University of Maine, 1958; Ph.D., Rutgers University, 1962

BENJAMIN V. DALL (1975), *Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., Yale University, 1955; M.F., 1956; J.D., University of Virginia, 1959; Ph.D., Pennsylvania State University, 1972

ROBERT W. DAVIDSON (1957), *Professor*, Department of Wood Products Engineering; *Director*, Tropical Timber Information Center; B.S., Montana State University, 1948; M.S., State University of New York College of Forestry, 1956; Ph.D., 1960

ARNOLD C. DAY (1947), *Technical Specialist*, N.C. Brown Center for Ultrastructure Studies

SALVACION DE LA PAZ (1973), *Associate Librarian*, F. Franklin Moon Library; B.S.L.S., University of the Philippines, 1956; M.S.L.S., Simmons College, 1962

CARLTON W. DENCE (1951), *Senior Research Associate*, Empire State Paper Research Institute; Graduate Program in Environmental Science; *Professor*, B.S., Syracuse University, 1947; M.S., State University of New York College of Forestry, 1949; Ph.D., 1959

CARL H. DE ZEEUW (1946), *Professor*, Department of Wood Products Engineering; A.B., Michigan State College, 1934; B.S., 1937; M.S., State University of New York College of Forestry, 1939; Ph.D., 1949

ARTHUR G. DILLON (1976), *Technical Specialist*, Department of Paper Science and Engineering; B.S., State University of New York College of Environmental Science and Forestry, 1974

DANIEL L. DINDAL (1966), *Professor*, Department of Environmental and Forest Biology; B.S., Ohio State University, 1958; M.A., 1961; Ph.D., 1967; *Chancellor's Award for Excellence in Teaching* (1974)

JULIA O. DOMINGUE (1980), *Technical Specialist*, Department of Forest Engineering; B.A., University of Illinois, 1975; M.S., 1979

MICHAEL J. DUGGIN (1979), *Associate Professor*, Department of Forest Engineering; B.Sc., Melbourne University, 1959; Ph.D., Monash University, 1965

PATRICK R. DURKIN (1980), *Adjunct Assistant Professor*, Graduate Program in Environmental Science; B.A., State University of New York College of Fredonia, 1968; M.S., Fordham University, 1972; Ph.D., State University of New York College of Environmental Science and Forestry, 1979

GEORGE F. EARLE (1952), *Professor*, School of Landscape Architecture; B.F.A., Syracuse University, 1937; M.F.A., Yale University, 1946

RONALD EBY (1968), *Research Associate*, Chemistry Department; B.S., State University of New York College of Environmental Science and Forestry, 1969; M.S., 1972; Ph.D., 1974

DONALD EGGEN (1979), *Technical Specialist*, School of Forestry; B.S., University of Michigan, 1975; M.S., 1978

ANDREW L. EGGERS (1967), *Technical Specialist*, Educational Communications Section, Office of the Vice President for Administration and Services

THOMAS ELIAS (1977), *Adjunct Associate Professor*, Department of Environmental and Forest Biology; B.A., Southern Illinois University, 1964; M.A., 1966; Ph.D., St. Louis University and the Missouri Botanical Garden, 1969

ELIZABETH A. ELKINS (1973), *Associate Librarian*, F. Franklin Moon Library; B.A., Hartwick College, 1968; M.L.S., State University of New York at Geneseo, 1970

JOHN H. ENGELKEN (1952), *Assistant Professor; Forest Property Manager*, Tully Campus; B.S.F., Utah State University, 1950

GAIL ERWIN (1979), *Adjunct Member*, Employee Performance Evaluation Program Appeals Board; B.A., William Smith College, 1971; M.S., State University of New York at Oswego, 1974; J.D., Western New England College School of Law, 1978

ARTHUR R. ESCHNER (1961), *Professor*, School of Forestry; B.S., State University of New York College of Forestry, 1950; M.S., Iowa State College, 1952; Ph.D., State University of New York College of Forestry, 1965

AMINUR EUSUFZAI (1977), *Technical Assistant*, Empire State Paper Research Institute; B.Sc. (Hons.), Dacca University, 1957; M.Sc., 1960; B.Sc. (Hons.), Peshawar University, 1962, M.S., West Virginia University, 1969

MILDRED FAUST (1976), *Adjunct Professor*, School of Biology, Chemistry and Ecology; A.B., Penn College, 1921; M.S., University of Chicago, 1923; Ph.D., 1933

JOHN P. FELLEMAN (1973), *Associate Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.C.E., Cornell University, 1966; M.E.C., 1966; D.P.A., New York University, 1975

JEAN E. FISHER (1950-1952) (1963), *Senior Research Associate*, School of Forestry; *Professor*; B.S., University of Idaho, 1941

JOHN S. FISHLOCK (1965), *Technical Assistant*, Department of Environmental and Forest Biology; A.A.S., State University of New York College of Forestry, 1975

MICHAEL FLASHNER (1973), *Associate Professor*, Department of Chemistry; B.S., Brooklyn College, 1965; A.M., University of Michigan, 1970; Ph.D., 1971

JOHN J. FLYNN (1979), *Research Associate*, School of Forestry; B.S., Morris Harvey College, 1971; M.S., Hofstra University, 1977

JOHN S. FORSTER (1979), *Director of Personnel and Affirmative Action*, Office of the Vice President for Administration and Services; B.S., State University of New York at Buffalo, 1974; M.B.A., 1976

CLAUDE C. FREEMAN (1959), *Associate Professor*, School of Landscape Architecture; B.S., State University of New York College of Forestry, 1959

ROBERT H. FREY (1977), *Assistant Vice President for Academic Programs*, *Associate Professor*, B.A., Valparaiso University, 1965; M.Ed., Springfield College, 1966; Ed.D., Indiana University, 1973

ROBERT L. FRIEDMAN (1967), *Director of Admissions*, Office of the Vice President for Program Affairs; A.B., Syracuse University, 1952; M.A., 1954

ELLEN M. GALLAGHER (1980), *Technical Assistant*, Department of Environmental and Forest Biology; B.S., State University of New York at Cortland, 1974

JAMES W. GEIS (1968), *Assistant Vice President for Research Programs*, *Executive Director of the Institute of Environmental Program Affairs*, *Professor*, Department of Environmental and Forest Biology; B.S.F., University of Illinois, 1965; M.S., 1967; Ph.D., State University of New York College of Environmental Science and Forestry, 1972

RONALD J. GIEGERICH (1977), *Technical Assistant*, Department of Environmental and Forest Biology; A.A.S., State University of New York Agricultural and Technical College at Cobleskill, 1976; B.S., State University of New York College of Environmental Science and Forestry, 1978

SERGE N. GORBATSEVICH (1956), *Associate Professor*, Department of Paper Science and Engineering; B.S., State University of New York College of Forestry, 1954; M.S., 1955

MORT GRANT (1976), *Adjunct Professor*, Institute of Environmental Program Affairs; B.A., Whitman College, 1945; M.B.A., University of Chicago, 1949; M.P.A., Harvard University, 1959

STEPHEN GRANZOW (1969), *Technical Specialist*, Empire State Paper Research Institute

MIKLOS A. J. GRATZER (1973), *Professor*, School of Forestry; Graduate Program in Environmental Science; B.Sc., University of British Columbia, 1959; M.S.R.C., University of Montana, 1965; Ph.D., 1971

PAUL F. GRAVES (1947), *Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1939; M.F., 1941; Ph.D., Syracuse University, 1949

CHARLES GREEN, JR. (1979), *Adjunct Professor*, Department of Paper Science and Engineering; B.S., University of Iowa, 1956

DAVID H. GRIFFIN (1968), *Associate Professor*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1959; M.A., University of California, 1960; Ph.D., 1963

JAMES P. HALLIGAN (1979), *Technical Assistant*, School of Forestry; B.S., State University of New York College of Environmental Science and Forestry, 1974

ROGER P. HAMERNIK (1980), *Adjunct Postdoctoral Associate*, Department of Wood Products Engineering; B.S., Syracuse University, 1963; M.S., 1967; Ph.D., 1970

JUDITH C. HAMILTON (1979), *Financial Aids Advisor*, Financial Aids Office; B.S., State University College at Brockport, 1967; M.S., State University of New York at Albany, 1968

ALAN LEE HANKIN (1978), *Associate for Continuing Education*, School of Continuing Education; B.A., Boston University, 1971; Teaching Certificate, University of New Hampshire, 1974

ROBERT B. HANNA (1977), *Assistant Director*, N.C. Brown Center for Ultrastructure Studies; *Associate Professor*, Department of Wood Products Engineering and Graduate Program in Environmental Science; B.S., University of Michigan, 1967; M.S. State University of New York College of Environmental Science and Forestry, 1971; Ph.D., 1973

DAVID L. HANSELMAN (1963), *Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.S., Cornell University, 1957; M.S., 1958; Ph.D., Ohio State University, 1963

DAVID B. HARPER (1972), *Senior Research Associate*, School of Landscape Architecture; Graduate Program in Environmental Science; B.S., Bates College, 1959; M.R.P., University of Pennsylvania, 1969

ROY C. HARTENSTEIN (1959-65) (1967), *Professor*, Department of Environmental and Forest Biology; B.S., State Teachers College at Buffalo, 1953; M.S., Syracuse University, 1957; Ph.D., State University of New York College of Forestry, 1959

ALAN HARVEY (1977); *Technical Specialist*, Analytical and Technical Services

JOHN P. HASSETT (1980), *Research Associate*, School of Biology, Chemistry and Ecology; B.S., University of Maryland, 1971; M.S., University of Wisconsin, 1973; Ph.D., 1977

RICHARD S. HAWKS (1979), *Assistant Professor*, School of Landscape Architecture; B.L.A., State University of New York College of Environmental Science and Forestry, 1972; M.L.A., Harvard University, 1978

GORDON M. HEISLER (1973), *Adjunct Assistant Professor*, School of Forestry; B.S., Pennsylvania State University, 1961; M.F., Yale University, 1962; Ph.D., State University of New York College of Forestry, 1970

ROBERT D. HENNIGAN (1967), *Director*, Graduate Program in Environmental Science; B.C.E., Manhattan College, 1949; M.A., Syracuse University, 1964

LEE P. HERRINGTON (1965), *Professor*, School of Forestry; B.S., University of Maine, 1959; M.F., Yale School of Forestry, 1960; Ph.D., Yale University, 1964

DEBORAH B. HILL (1979), *Research Associate*, School of Forestry, B.S., Tufts University, 1964; M.Ed., Boston University, 1968; M.F.S., Yale University, 1973; Ph.D., 1977

EDMUND HILLIARD (1978), *Adjunct Assistant Professor*, Institute for Environmental Program Affairs, B.L.A., State University of New York College of Environmental Science and Forestry, 1967

BERNARD T. HOLTMAN (1968), *TV/Motion Picture Producer-Director*, *Director*, Educational Communications Section, Office of the Vice President for Administration and Services; Graduate Program in Environmental Science; B.A., Siena College, 1950; M.S., Syracuse University, 1972

PAUL F. HOPKINS (1979), *Assistant Professor*, Forest Engineering; B.S., University of Maine, 1977; M.S., State University of New York College of Environmental Science and Forestry, 1979

ALLEN F. HORN, JR. (1957), *Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., Michigan State University, 1950; M.S., 1951; Ph.D., State University of New York College of Forestry, 1957; L.L.B., Syracuse University, 1967

STEPHEN B. HORSLEY (1979), *Adjunct Assistant Professor*, School of Forestry, B.S., Pennsylvania State University, 1965; M.A., University of Massachusetts, 1968; Ph.D., 1970

JOEL R. HOWARD (1977), *Coordinator*, Summer Sessions in Field Forestry; *Instructor*, School of Forestry; State University of New York College of Forestry (Ranger School), 1966; Forest Property Manager, Warrensburg, 1979; B.S., State University of New York College of Environmental Science and Forestry, 1973; M.S., 1977

JOHN J. HOWARD (1978), *Adjunct Assistant Professor*, Department of Environmental and Forest Biology; B.A., Yale University, 1966; M.P.H., 1970; Ph.D., 1973

HIROSHI ITO (1976), *Research Associate*, Department of Chemistry; Ph.D., University of Tokyo, 1976

HUGO A. JAMNBACK (1973), *Adjunct Senior Research Associate*, Department of Environmental and Forest Biology; B.A., Boston University, 1949; M.A., University of Massachusetts, 1951; Ph.D., 1953

ROBERT V. JELINEK (1972), *Professor*, Department of Paper Science and Engineering; Graduate Program in Environmental Science; B.S., Columbia University, 1945; M.S., 1947; Ph.D., 1953

HAZEL S. JENNISON (1965), *Research Assistant*, Analytical and Technical Services, Office of the Vice President for Administration and Services; B.S., Western Kentucky State University, 1941; M.S., Syracuse University, 1966

DAVID L. JOHNSON (1975), *Assistant Professor*, Department of Chemistry; Graduate Program in Environmental Science; B.S., Antioch College, 1965; Ph.D., University of Rhode Island, 1973

ROBERTA S. JONES (1979), *Assistant Registrar*, Office of the Vice President for Student Affairs; A.B., Colgate University, 1978

DAVID F. KARNOSKY (1977), *Adjunct Assistant Professor*, Department of Environmental and Forest Biology; B.S., University of Wisconsin, 1971; M.S., 1972; Ph.D., 1975

RONALD R. KARNS (1965), *Editorial Associate*, Office of Publications; B.S., Ohio State University, 1954

ROWENA V. KATHER (1974), *Assistant to the Director*, Analytical and Technical Services, Office of the Vice President for Administration and Services; B.A., Syracuse University, 1979

CLEMENS M. KAUFMAN (1979), *Professor*, Yezin, Burma; Ph.D., University of Minnesota, 1943

EDWIN H. KETCHLEDGE (1955), *Distinguished Teaching Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1949; M.S., 1950; Ph.D., Stanford University, 1957

LEE E. KOPPELMAN (1975), *Adjunct Professor*, Institute of Environmental Program Affairs; B.E., City College of New York, 1950; M.S., Pratt Institute Graduate School of Architecture, 1962; D.P.A., New York University, 1970

DONALD E. KOTEN (1961), *Associate Professor*, School of Forestry; B.A., North Central College, 1951; B.S., Oregon State College, 1957; Ph.D., State University of New York College of Forestry, 1966

STELLA D. KROFT (1973), *Technical Assistant*, F. Franklin Moon Library

VIRENDRA KUMAR (1979), *Research Associate*, Department of Chemistry; B.S. (Hons.), Banaras Hindu University, 1966; M.S., 1968; Ph.D., State University of New York at Buffalo, 1975

FRANK E. KURCZEWSKI (1966), *Professor*, Department of Environmental and Forest Biology; B.S., Allegheny College, 1958; M.S., Cornell University, 1962; Ph.D., 1964

GEORGE H. KYANKA (1967), *Chairman and Associate Professor*, Department of Wood Products Engineering; B.S., Syracuse University, 1962; M.S., 1966; *Chancellor's Award for Excellence in Teaching* (1973); Ph.D., 1976

ROBERT T. LALONDE (1959), *Professor*, Department of Chemistry; B.A., St. John's University, 1953; Ph.D., University of Colorado, 1957

JUDITH A. LAMANNA (1973), *Assistant to the Vice President*; Office of the Vice President for Administration and Services; A.A.S., Onondaga Community College, 1969; B.A., LeMoyne College, 1971; M.P.A., Syracuse University, 1976

GERALD N. LANIER (1970), *Professor*, Department of Environmental and Forest Biology; B.S., University of California, 1960; M.S., 1965; Ph.D., 1967

RONALD F. LAPLAINE (1948), *Technical Specialist*, Department of Paper Science and Engineering

CHARLES C. LARSON (1950), *Professor*, School of Forestry; A.S., North Dakota State School of Forestry, 1938; B.S., University of Minnesota, 1940; M.S., University of Vermont, 1943; Ph.D., State University of New York College of Forestry, 1952

RICHARD V. LEA (1946-56) (1967), *Associate Professor*, School of Forestry; B.S., State University of New York College of Forestry, 1946; M.S., 1948; Ph.D., 1953

CHARLES N. LEE (1959), *Director*, Computer Services; *Professor*, Department of Forest Engineering; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1949; B.C.E., Syracuse University, 1957; M.C.E., 1959

RAYMOND E. LEONARD (1964), *Adjunct Professor*, Institute of Environmental Program Affairs; B.S., University of Vermont, 1955; M.M.M., University of Helsinki, 1957; M.F., Yale University, 1964; Ph.D., State University of New York College of Forestry, 1967

BENGT LEOPOLD (1961), *Professor and Chairman*, Department of Paper Science and Engineering; *Director*, Empire State Paper Research Institute; B.Sc., Royal Institute of Technology, Stockholm, 1947; Licentiat, 1949; Ph.D., 1952

GIDEON LEVIN (1972), *Associate Professor*, Polymer Research Institute; B.S., Technion, Israel Institute of Technology, 1960; M.S., Purdue University, 1965; Ph.D., State University of New York College of Forestry, 1971

ALLEN R. LEWIS (1970), *Associate Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.A., University of Oklahoma, 1959; M.C.P., University of California (Berkeley), 1961; *Executive Chairman of the Faculty* (1978)

PHILIP LUNER (1957), *Senior Research Associate*, Empire State Paper Research Institute; Professor, Graduate Program in Environmental Science; *Associate Member*, Polymer Research Institute; B.Sc., University of Montreal (Loyola College), 1947; Ph.D., McGill University, 1951

EDWARD M. LUNK (1978), *Instructor*, School of Forest Technology, B.S., University of Michigan, 1971; B.S.F., 1976; M.S. 1975

J. DONALD MABIE (1967), *Coordinator for Sponsored Programs*, Office of the Vice President for Program Affairs; B.S., State University of New York at Albany, 1961

CHARLES C. MADDISON (1977), *Technical Assistant*, Adirondack Ecological Center

WALTER A. MAIER (1968), *Technical Specialist*, Department of Wood Products Engineering; B.S., State University of New York College of Forestry, 1960

PAUL D. MANION (1967), *Professor*, Department of Environmental and Forest Biology; B.S., University of Minnesota, 1962; M.S., 1965; Ph.D., 1967

MARY ANNE T. MARANO (1972), *Bursar*, Office of the Vice President for Administration and Services; A.A., Onondaga Community College, 1967

FRANK L. MARAVIGLIA (1964), *Associate Professor*, School of Landscape Architecture; B.S., State University of New York College at Oswego, 1958; M.S., Hofstra University, 1963

RICHARD E. MARK (1970), *Senior Research Associate*, Empire State Paper Research Institute; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1950; Master of Forestry, Yale University, 1960; Doctor of Forestry, 1965

RAYMOND L. MARLER (1970), *Senior Research Associate*, School of Forestry; B.S., University of Michigan, 1948; M.F., 1948

DAVID A. MARQUIS (1979), *Adjunct Professor*, School of Forestry; B.S., Pennsylvania State University, 1955; M.S., Yale University, 1963; Ph.D., 1973

CHARLES E. MARTIN II (1962), *Professor*, School of Forest Technology; B.S., Duke University, 1953; M.F., 1954

GEORGE MARTIN (1979), *Adjunct Assistant Professor*, Department of Chemistry; *Associate Member*, Polymer Research Institute; B.S., Purdue University, 1970; Ph.D., University of Minnesota, 1976

GEORGE F. MATTFELD (1965) (1978), *Adjunct Associate Professor*, Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1962; M.S., University of Michigan, 1964; Ph.D., State University of New York College of Environmental Science and Forestry, 1974

CHARLES B. MAYNARD (1980), *Research Associate*, School of Forestry; B.S., Iowa State University, 1974; M.S., 1977; Ph.D., Iowa State University, 1980

RICHARD MCCLIMANS (1977), *Senior Research Associate*, Department of Forest Engineering; B.S., Merrimack College, 1961

JAMES P. MCKENNA (1979), *Assistant Professor*, Department of Wood Products Engineering; B.S., State of New York College of Environmental Science and Forestry, 1977; M.S., 1979

JOHN J. MCKEON (1969), *Technical Specialist*, N.C. Brown Center for Ultrastructure Studies

DONALD G. MCLEAN (1968), *Programmer Analyst*, Computer Center; B.A., Syracuse University, 1975

THOMAS O. MEHEN (1979) *Executive Director*, Syracuse Pulp and Paper Foundation and Forestry Foundation; B.S., Arizona State University, 1960

VINEETA MEHRA (1979), *Visiting Assistant Professor*, School of Landscape Architecture; B.S., Chandigach, India, College of Architecture, 1975; M.L.A. No. Delhi, India, School of Planning and Architecture, 1977

JOHN A. MEYER (1958), *Director*, Analytical and Technical Services, Office of the Vice President for Administration and Services; *Senior Research Associate and Professor*, Department of Chemistry; Graduate Program in Environmental Science; *Associate Member*, Polymer Research Institute; B.S., Pennsylvania State College, 1949; M.S., 1950; Ph.D., State University of New York College of Forestry, 1958; *Chancellor's Award for Excellence in Professional Service* (1977)

ROBERT W. MEYER (1979), *Associate Professor*, Department of Wood Products Engineering; B.S.F., University of Washington, 1962; M.F., 1964; Ph.D., State University of New York College of Forestry, 1967

HOWARD C. MILLER (1950), *Extension Specialist and Professor*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1941; Ph.D., Cornell University, 1951

RICHARD W. MILLER (1966), *Assistant Professor*, School of Forest Technology; State University of New York College of Forestry (Ranger School), 1953; B.S., State University of New York College of Forestry, 1956

MYRON J. MITCHELL (1975), *Associate Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.A., Lake Forest College, 1969; Ph.D., University of Calgary, 1974

ALFRED V. MOLLITOR, JR. (1976), *Technical Assistant*, Department of Environmental and Forest Biology; B.S., State University of New York College of Environmental Science and Forestry, 1976

DOUGLAS B. MONTEITH (1977), *Senior Research Associate*, School of Forestry; B.S., University of Maine, 1965; M.S., 1967

RAYMOND A. MOORE (1954), *Associate Professor*, Department of Wood Products Engineering; B.S.F., West Virginia University, 1951; M.S., North Carolina State College, 1952

CHARLIE D. MORRIS (1972), *Adjunct Associate Professor*, Department of Environmental and Forest Biology; B..S., Ohio University, 1963; M.S., University of Wisconsin, 1967; Ph.D., 1969

DOUGLAS A. MORRISON (1969), *Research Associate*, School of Forestry; Graduate Program in Environmental Science; B.A., University of Western Ontario, 1966; M.S., University of Oregon, 1967; Ph.D., 1969

DIETLAND MULLER-SCHWARZE (1973), *Professor*, Department of Environmental and Forest Biology; Doctorate, Max Planck Institute, 1958-1960; Ph.D., University of Freiburg, 1963

EDWARD J. MULLIGAN (1967), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services; Certified graduate, Morrisville Agricultural and Technical College, 1942

JAMES P. NAKAS (1979), *Assistant Professor*, Department of Environmental and Forest Biology; B.S., LeMoyne College, 1968; M.S., Seton Hall University, 1970; Ph.D., Rutgers University, 1976

TSUTOMU NAKATSUGAWA (1968), *Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B. Agric., Tokyo University, 1957; M.S., Iowa State University, 1961; Ph.D., 1964

ANTHONY J. NAPPI (1975), *Adjunct Associate Professor*, Department of Environmental and Forest Biology; B.S., Central Connecticut State, 1959; M.S., 1964; Ph.D., University of Connecticut, 1968

ALFRED H. NISSAN (1979), *Adjunct Professor*, Department of Paper Science and Engineering; B.Sc., Birmingham University, 1937; Ph.D., 1940; D. Sc., 1943

ROGER L. NISSEN, JR. (1971), *Technical Assistant*, School of Forestry; A.A.S., Paul Smith's College, 1970

ROBERT S. NORTH (1975), *Registrar*, Office of the Vice President for Student Affairs; A.B., Syracuse University, 1952

ROY A. NORTON (1970), *Research Associate*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1969; M.S., 1973; Ph.D., 1977

JOHN D. NOVADO (1967), *Editorial Associate*, Office of Publications; B.A., Syracuse University, 1965

RALPH D. NYLAND (1967), *Associate Professor*, School of Forestry; B.S., State University of New York College of Forestry, 1958; M.S., 1959; Ph.D., Michigan State University, 1966

SHEILA O'ROURKE (1979), *Assistant to the Vice President for Student Affairs*, Office of Student Affairs; A.A., Cape Cod Community College, 1974; B.A., University of Massachusetts, 1976; M.Ed., Suffolk University, 1979

DONALD A. PAFKA (1967), *Technical Assistant*, School of Forestry; A.A.S., State University of New York Agricultural and Technical College at Morrisville, 1956; State University of New York College of Forestry (Ranger School), 1966

CARL E. PALM, JR. (1972), *Technical Assistant*, School of Forestry; A.A.S., Paul Smith's, 1972

DAVID G. PALMER (1966), *Associate Professor*, Department of Forest Engineering; Graduate Program in Environmental Science; B.S., General Motors Institute, 1962; M.S., Syracuse University, 1964; Ph.D., 1975

EDWARD E. PALMER (1969), *President*; A.B., Middlebury College, 1939; Ph.D., Syracuse University, 1949

ANTHONY PANABIANCO (1979), *Adjunct Member*, Employee Performance Evaluation Program Appeals Board; B.S., Marquette University, 1969; M.S., State University of New York at Binghamton, 1980

ANGELOS V. PATSIS (1979), *Adjunct Professor*, Department of Chemistry; *Associate Director for Continuing Education of the Polymer Research Institute*; B.S., Athens University, 1954; M.S., Case-Western Reserve, 1958; Ph.D., 1959

BRUCE PATTERSON (1978), *Technical Assistant*, Computer Center; B.A., State University of New York at Oswego, 1974

THOMAS A. PAULO (1974), *Associate Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; A.B., New York University, 1968; J.D., 1971; M.L.A., State University of New York College of Environmental Science and Forestry, 1974

HARRISON H. PAYNE (1964), *Vice President for Student Affairs; Professor*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1950; M. Ed., St. Lawrence University, 1955; Ed. D., Cornell University, 1963

JANIS PETRICEKS (1968), *Professor*, School of Forestry; Diploma in Forestry, University of Freiburg, 1950; M. Agr., Interamerican Institute of Agricultural Sciences, 1956; Ph.D., State University of New York College of Forestry, 1968

GUY PIROLLA (1979), *Technical Assistant*, Department of Chemistry, B.S., State of New York College of Environmental Science and Forestry, 1963

JOHN C. POLICASTRO (1978), *Technical Assistant*, School of Forest Technology; A.A.S., State University of New York College of Environmental Science and Forestry, 1977

PATRICIA K. BARON POLLAK (1973), *Associate Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.A., Carnegie Mellon University, 1967; M.R.P., Syracuse University, 1972; M.A., Tufts University, 1974; Ph.D., Syracuse University, 1975

JACOBUS B. POOT (1967), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services

WILLIAM F. PORTER (1978), *Assistant Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., University of Northern Iowa, 1973; M.S., University of Minnesota, 1976; Ph.D., 1979

DONALD POTTS (1978), *Adjunct Professor*, School of Forestry; B.A., State University of New York at Buffalo, 1972; M.S., State University of New York College of Environmental Science and Forestry, 1976; Ph.D., 1978

DUDLEY J. RAYNAL (1974), *Associate Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., Clemson University, 1969; Ph.D., University of Illinois, 1974

THOMAS B. REAGAN (1971), *Television Engineer*, Educational Communications Section, Office of the Vice President for Administration and Services

BRUCE E. REICHEL (1974), *Director of Physical Plant*, Office of the Vice President for Administration and Services; B.S., State University of New York College of Environmental Science and Forestry, 1973

ROBERT G. REIMANN (1962), *Dean and Professor*, School of Landscape Architecture; B.S., State University of New York College of Forestry, 1954

KERMIT E. REMELE (1962), *Associate Professor*, School of Forest Technology; State University of New York College of Forestry (Ranger School), 1943; B.S., State University of New York College of Forestry, 1949; M.F., University of Michigan, 1952

NORMAN A. RICHARDS (1963), *Professor*, School of Forestry; B.S., State University of New York College of Forestry, 1957; M.S., Cornell University, 1959; Ph.D., State University of New York College of Forestry, 1968

NEIL H. RINGLER (1975), *Associate Professor*, Department of Environmental and Forest Biology; B.S., California State University at Long Beach, 1967; M.S., Oregon State University, 1970; Ph.D., University of Michigan, 1975

JOHN K. ROBERTSON (1978), *Adjunct Associate Professor*, Graduate Program in Environmental Science; B.S., City College of New York, 1966; M.B.A., Long Island University, 1976; M.S., University of Chicago, 1968; Ph.D., 1970

JOHN R. ROMAN (1977), *Technical Specialist*, Department of Environmental and Forest Biology; B.S., Vanderbilt University, 1973; Ph.D., State University of New York College of Environmental Science and Forestry, 1980

KATHERINE P. ROSSI (1966), *Associate Librarian*, F. Franklin Moon Library; B.A., William Smith College, 1945; M.S.L.S., Syracuse University, 1966

SAMUEL ROTHENBERG (1946), *Research Associate*, Empire State Paper Research Institute; B.S., State University of New York College of Forestry, 1943; M.S., 1964

ROWAN A. ROWNTREE (1977) *Adjunct Associate Professor*, Graduate Program in Environmental Science; B.A. (hons.) California State University, 1966; M.S., University of California, Berkeley, 1970; Ph.D., 1973

RICHARD W. SAGE, JR. (1970), *Research Assistant and Property Forester*, Adirondack Ecological Center; B.S., State University of New York College of Forestry, 1966

RALPH A. SANDERS (1979), *Adjunct Associate Professor*, School of Forestry, Graduate Program in Environmental Science; B.A., Dartmouth College, 1963; M.A., Pennsylvania State University, 1967; Ph.D., University of Minnesota, 1974

ANATOLE SARKO (1967), *Professor*, Department of Chemistry; *Associate Member*, Polymer Research Institute; B.S., Upsala College, 1952; M.S., New York University, 1960; Ph.D., State University of New York College of Forestry, 1966

MICHAIL SCHAEDLE (1965), *Associate Professor*, Department of Environmental and Forest Biology; B.S., University of British Columbia, 1957; M.S., 1959; Ph.D., University of California, 1964

DANIEL E. SCHIFFHAUER (1979), *Technical Assistant*, Department of Environmental and Forest Biology; B.S., State University of New York College of Environmental Science and Forestry, 1978

CONRAD SCHUERCH (1949), *Distinguished Professor*, Department of Chemistry; *Associate Member*, Polymer Research Institute; B.S., Massachusetts Institute of Technology, 1940; Ph.D., 1947

RICHARD A. SCHWAB (1976), *Assistant Director of Physical Plant*, Office of the Vice President for Administration and Services; B.S., State University of New York College of Environmental Science and Forestry, 1969

VINCENT SCICCHITANO (1979), *Adjunct Member*, Employee Performance Evaluation Program Appeals Board; B.S., LeMoyne College, 1957

PATRICK E. SHARPE (1978), *Technical Assistant*, Department of Paper Science and Engineering; B.S., Rochester Institute of Technology, 1974

WILLIAM SHIELDS (1979), *Assistant Professor*, Department of Environmental and Forest Biology; A.B., Rutgers University, 1974; M.S., Ohio State University, 1976; Ph.D., 1979

JOHN F. SIAU (1963-64) (1965) (1966), *Professor*, Department of Wood Products Engineering; B.S., Michigan State University, 1943; M.S., State University of New York College of Forestry, 1965; Ph.D., 1968

ROBERT M. SILVERSTEIN (1969), *Professor*, Department of Chemistry; B.S., University of Pennsylvania, 1937; M.S., New York University, 1941; Ph.D., 1949

JOHN B. SIMEONE (1948), *Professor and Chairman*, Department of Environmental and Forest Biology; B.S., Rhode Island State College, 1942; M.F., Yale University, 1948; Ph.D., Cornell University, 1960

THOMAS O. SLOCUM (1977), *Director of Counseling*, Office of the Vice President for Student Affairs; B.S., State University of New York at Brockport, 1967; M.S., State University of New York at Albany, 1968

RICHARD C. SMARDON (1979), *Research Associate*, School of Landscape Architecture; B.S., University of Massachusetts, 1970; M.S., 1973

JOHANNES SMID (1956-57) (1960), *Professor*, Department of Chemistry; *Associate Member*, Polymer Research Institute; B.Sc., Free University of Amsterdam, 1952; M.Sc., 1954; Ph.D., State University of New York College of Forestry, 1957

JERI LYNN SMITH (1977), *Editorial Associate*, Community Relations; B.A., Syracuse University, 1975

KENNETH J. SMITH, JR. (1968), *Professor and Chairman*, Department of Chemistry; Graduate Program in Environmental Science; *Acting Director*, Polymer Research Institute; B.A., East Carolina University, 1957; M.A., Duke University, 1959; Ph.D., 1962

LEONARD A. SMITH (1964), *Assistant Professor*, Department of Wood Products Engineering; *Associate Member*, Polymer Research Institute, B.S., Ch.E., University of Dayton, 1962; M.S., Ch.E., Case Institute of Technology, 1964; Ph.D., State University of New York College of Environmental Science and Forestry, 1972

GEORGE A. SNYDER (1970), *Technical Specialist*, Educational Communications Section, Office of the Vice President for Administration and Services

DAVID J. SODERBERG (1979), *Technical Specialist*, Administrative Data Processing; B.A., State University of New York at Oneonta, 1975; B.S., State University of New York College of Environmental Science and Forestry, 1979

FRANCIS M. SOLAN (1974), *Technical Assistant*, School of Forestry; A.A.S., State University of New York at Morrisville, 1971

BRIAN M. SPEER (1964), *Director of Campus Security*, Office of the Vice President for Administration and Services; A.A.S., Mohawk Valley Community College, 1975; B.P.S. in Policy Administration, State University of New York College of Technology at Rome, 1979

GEORGE H. STAUFFER (1979), *Research Associate*, School of Forestry; B.A., University of California, 1964; M.S., 1978

THEODORE J. STENUF (1960), *Distinguished Teaching Professor*, Department of Paper Science and Engineering; B.Ch.E., Syracuse University, 1949; M.Ch.E., 1951; Ph.D., 1953

JOHN J. STERBENZ (1973), *Assistant Professor*, School of Forest Technology; State University of New York College of Forestry (Ranger School), 1966; B.S., University of Michigan, 1970; M.F., 1972

S. ALEXANDER STERN (1979), *Adjunct Professor*, Department of Chemistry; *Associate Member*, Polymer Research Institute; B.S., Israel Institute of Technology, 1945; M.S., Ohio State University, 1948; Ph.D., 1952

JACK C. STEVENS (1980), *Technical Assistant*, School of Forestry; B.S., State University of New York College of Environmental Science and Forestry, 1977

WILLIAM M. STITELER (1973), *Professor*, School of Forestry, Graduate Program in Environmental Science; B.S., Pennsylvania State University, 1964; M.S., 1965; Ph.D., 1970

DENNIS O. STRATTON (1978), *Associate Director of Admissions*, Admissions Office; B.S., State University of New York at Cortland, 1966; M.S., 1967

WESLEY E. SUHR (1974), *Associate Professor*, School of Forest Technology; B.S., University of Minnesota, 1958; M.S., University of Arizona, 1965

DANIEL A. SUNDQUIST (1979), *Assistant Professor*, School of Landscape Architecture, B.L.A., State University of New York College of Environmental Science and Forestry, 1970

PAUL SZEMKOW (1978), *Technical Assistant*, Department of Paper Science and Engineering, Department of Forest Engineering; B.S., Empire State College, 1976

DAVID W. TABER (1970), *Adjunct Extension Specialist*, School of Forestry; B.S., University of Maine, 1961; M.S., 1968

STUART W. TANENBAUM (1973), *Dean and Professor*, School of Biology, Chemistry and Ecology; B.S., City College of New York, 1944; Ph.D., Columbia University, 1951

HERBERT B. TEPPER (1962), *Professor*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1953; M.S., 1958; Ph.D., University of California, 1962

FRED C. TERRACINA (1975), *Research Associate*, Department of Environmental and Forest Biology; B.A., Harpur College, 1964; M.A., State University of New York at Binghamton, 1969; Ph.D., State University of New York College of Environmental Science and Forestry, 1976

ROGER C. THOMPSON (1975), *Adjunct Professor*, Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1951; M.S., Syracuse University, 1952; Ph.D., State University of New York College of Forestry, 1961

JAMES L. THORPE (1965), *Research Associate*, Empire State Paper Research Institute; B.S., State University of New York College of Forestry, 1965; M.S., 1967

WILLIAM C. TIERSON (1949), *Director of Wildlife Research*, Adirondack Ecological Center; *Forest Property Manager*, The Archer and Anna Huntington Wildlife Forest; B.S., State University of New York College of Forestry, 1949; M.F., 1967

TORE E. TIMELL (1962), *Professor*, Department of Chemistry; *Director*, Cellulose Research Institute; *Associate Member*, Polymer Research Institute; Civiling., Royal Institute of Technology, Stockholm, 1946; Tekn. lic., 1948; Ph.D., 1950

VIRGINIA TORELLI (1975), *Adjunct Foreign Student Counselor*, Office of the Vice President for Student Affairs; B.A., Syracuse University, 1944

R. GARY TREGASKIS (1969), *Technical Specialist*, Educational Communications Section, Office of the Vice President for Administration and Services; A.A.S., Broome Community College, 1967

WILLIAM P. TULLY (1966), *Dean and Professor*, School of Environmental and Resource Engineering; Graduate Program in Environmental Science; B.S., C.E., Northeastern University, 1964; M.S., C.E., 1966; Ph.D., Syracuse University, 1978

LESLIE L. TURAI (1976), *Professor*, Department of Paper Science and Engineering; Graduate Program in Environmental Science; B.S., University of Debrecen, 1936; M.S., 1937; Ph.D., University of Budapest, 1938

WILLIAM E. TYSON (1975), *Adjunct Lecturer*, Institute of Environmental Program Affairs; B.S., Florida State University, 1959; M.S., 1960

JOHN E. UNBEHEND (1972), *Research Assistant*, Empire State Paper Research Institute; A.A.S., Onondaga Community College, 1966; B.S., State University of New York College of Forestry, 1969; M.S., 1975

FREDRICK A. VALENTINE (1956), *Professor*, Department of Environmental and Forest Biology; B.S., St. Cloud State Teachers College, 1949; M.S., University of Wisconsin, 1953; Ph.D., 1957

LARRY W. VAN DRUFF (1970), *Associate Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., Mansfield State College, 1964; M.S., Cornell University, 1966; Ph.D., 1971

RAMESH C. VASISHTH (1975), *Adjunct Professor*, Department of Wood Products Engineering; Ph.D., University of Washington, 1960

DONNA C. VAVONESE (1978), *Assistant Director of Admissions*, Admissions Office; B.S., State University of New York at Oswego, 1971

JOHN E. VIEW (1979), *Director of Financial Aids*, Office of the Vice President for Student Affairs; B.A., St. Leo College, 1972; M.A., University of Notre Dame, 1974

DANIEL C. WALTON (1963), *Professor*, Department of Environmental and Forest Biology; B.Ch.E., University of Delaware, 1955; Ph.D., State University of New York College of Forestry, 1962

CHUN-JUAN WANG (1959), *Professor*, Department of Environmental and Forest Biology; B.S., Taiwan University, 1950; M.S., Vassar College, 1952; Ph.D., State University of Iowa, 1955

DONALD F. WEBSTER (1973), *Director of Libraries*, F. Franklin Moon Library; B.A., Hofstra University, 1959; M.L.S., Queens College, 1965

JOHN A. WEEKS (1977), *Adjunct Professor*, School of Forestry; B.S., Cornell University, 1949; M.S., Syracuse University, 1959

ROBERT G. WERNER (1966-69) (1970), *Professor*, Department of Environmental and Forest Biology; B.S., Purdue University, 1958; M.A., University of California, 1963; Ph.D., Indiana University, 1966

JANET R. WEST (1972), *Technical Assistant*, Department of Chemistry; B.S., State University of New York at Oswego, 1965

LAWRENCE W. WHELPTON (1969), *Technical Specialist*, Department of Environmental and Forest Biology; A.A.S., State University of New York Agricultural and Technical College at Alfred, 1965

EDWIN H. WHITE (1980), *Professor*, School of Forestry; B.S., State University of New York College of Environmental Science and Forestry, 1962; M.S., 1964; Ph.D., Auburn University, 1969

HUGH E. WILCOX (1951), *Professor*, Department of Environmental and Forest Biology; B.S., University of California, 1938; M.S., New York State College of Forestry, 1940; Ph.D., University of California, 1950

DAVID E. WILKINS (1966), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services

JAMES L. WILLIAMSON (1980), *Associate Librarian*, F. Franklin Moon Library; B.A., State University of New York at Albany, 1971; M.L.S., 1973

PETER F. WILTSIE (1968), *Assistant Director of Business and Fiscal Affairs*, Office of the Vice President for Administration and Services; A.B., Utica College of Syracuse University, 1965

JUDITH WOLFE (1977), *Technical Assistant*, U.S. Forest Service; B.S., State University of New York College of Environmental Science and Forestry, 1976

MARILYN L. WRIGHT (1974), *Assistant to the Director of Financial Aids*, Office of the Vice President for Student Affairs

JOHN M. YAVORSKY (1948-56) (1967), *Dean and Professor*, School of Continuing Education; B.S., State University of New York College of Forestry, 1942; M.S., 1947; Ph.D., 1955

ROBERT A. ZABEL (1947), *Professor*, Department of Environmental and Forest Biology; B.S., University of Minnesota, 1938; M.S., State University of New York College of Forestry, 1941; Ph.D., 1948

ALTON W. ZANDERS (1974), *Affirmative Action Officer*, Office of the Vice President for Administration and Services; *Assistant to Director for Minority Admissions*; B.S., Southern University (Baton Rouge, Louisiana), 1965; M.S., Syracuse University, 1970; J.D., 1974

EMERITUS

ERIC A. ANDERSON (1950-1975), *Professor Emeritus*; B.Sc.F., University of Washington, 1932; Ph.D., State University of New York College of Forestry, 1949

LAWRENCE J. BELANGER (1947-1965), *Registrar Emeritus*; *Professor Emeritus*; B.S., Syracuse University, 1932; M.S., New York State College for Teachers, Albany, 1941

C. ALLEN BICKFORD (1963-1972), *Professor Emeritus*; B.S., University of Idaho, 1925; M.S., Dartmouth College, 1931

ALFRED H. BISHOP (1942-1975), *Professor Emeritus*; B.S., New York State College of Forestry, 1929; M.F., 1931

FLOYD E. CARLSON (1930-1969), *Professor Emeritus*; B.S.F., University of Washington, 1928; M.F., 1930

DANIEL M. CASTAGNOZZI (1956-1977), *Professor and Director Emeritus*; A.A.S., State University of New York College of Forestry (Ranger School), 1950; B.S.F., University of Michigan, 1952; M.F., State University of New York College of Forestry, 1957

RAYMOND F. CROSSMAN (1942-1968), *Dean of Students Emeritus*; *Professor Emeritus*; B.A., Syracuse University, 1926; M.A., 1931

JAMES E. DAVIS (1947-1965), *Professor Emeritus*; B.S., Cornell University, 1924; M.F., 1926

RUSSELL C. DECKERT (1952-1976), *Professor Emeritus*; B.S.F., University of Georgia, 1938; M.F., Duke University, 1943

JAMES F. DUBUAR (1919-1957), *Director Emeritus, Ranger School; Professor Emeritus;* A.B., University of Michigan, 1913; M.S.F., 1915

C. EUGENE FARNSWORTH (1930-1972), *Professor Emeritus;* B.S.F., Iowa State College, 1926; M.F., Yale University, 1928; Ph.D., University of Michigan, 1945

CARL C. FORSAITH (1917-1959), *Professor Emeritus*; B.A., Dartmouth College, 1913; M.A., Harvard University, 1914; Ph.D., 1917

RUSSELL E. GETTY (1966-1973), *Professor Emeritus*; B.S., Iowa State College, 1936; M.S., 1951

DONALD F. GREEN (1965-1978), *Registrar Emeritus*; A.B., New York State College for Teachers, Albany, 1942; M.S., 1950

GEORGE H. HAINES (1953-1968), *Director of Business Affairs Emeritus*; B.S., University of Rhode Island, 1932

WILLIAM M. HARLOW (1928-1965), *Professor Emeritus*; B.S., New York State College of Forestry, 1925; M.S., 1926; Ph.D. 1928

RAY R. HIRT (1921-1959), *Senior Professor Emeritus*; B.S., Hamline University, 1917; M.S., New York State College of Forestry, 1924; Ph.D., 1928

RAYMOND J. HOYLE (1918-1957), *Professor Emeritus*; B.S., New York State College of Forestry, 1917; M.S., Syracuse University, 1930

EDWIN C. JAHN (1938-1972), *Dean Emeritus*; *Professor Emeritus*; B.S., New York State College of Forestry, 1925; M.S., 1926; Ph.D., McGill University, 1929

THEODORE J. KOCHANEK (1971-1976), *Director of Physical Plant Emeritus*

RICHARD W. LALOR (1953-1976), *Associate Professor Emeritus*; B.S., New York State College for Teachers, 1941; A.M., Cornell University, 1946

ORRIN L. LATHAM (1930-1966), *Associate Professor Emeritus*; B.S.F., Iowa State College, 1927; Yale University, 1932

JOSIAH L. LOWE (1933-1975), *Professor Emeritus*; B.S., New York State College of Forestry, 1927; Ph.D., University of Michigan, 1938

AUBREY H. MACANDREWS (1926-1962), *Professor Emeritus*; Truro Agriculture College, 1922; B.S., New York State College of Forestry, 1925; M.S., 1926

RENATA MARTON (1957), *Senior Research Associate Emeritus*, Master Ph. (Chemistry), Jagiello University, 1934; Ph.D., 1936

JOHN L. MORRISON (1946-1971), *Professor Emeritus*; A.B., University of Nebraska, 1933; A.M., 1935; Ph.D., University of California, 1941

FREDERIC W. O'NEIL (1937-1974), *Professor Emeritus*; B.S., New York State College of Forestry, 1933; M.S., 1935

RICHARD E. PENTONEY (1953-1979), *Vice President for Program Affairs Emeritus*; B.S., University of California, 1949; M.S., State University of New York College of Forestry, 1952; Ph.D., 1956

LUCIAN P. PLUMLEY (1936-1967), *Director Emeritus*, Ranger School; *Professor Emeritus*; New York State College of Forestry, (Ranger School), 1931; B.S.,New York State College of Forestry, 1935

SHELLEY W. POTTER, JR. (1956-1979), *Forest Property Manager Emeritus*; B.S., University of Michigan, 1951

BRADFORD G. SEARS (1941-1976), *Dean Emeritus*; *Professor Emeritus*; B.S., New York State College of Forestry, 1939; M.S., 1948

HARDY L. SHIRLEY (1945-1967), *Dean Emeritus*; *Professor Emeritus*; B.A., Indiana University, 1922; Ph.D., Yale University, 1928; D.h.c., University of Helsinki, 1958; D.Sc., Syracuse University, 1966

SAVEL B. SILVERBORG (1947-1977), *Professor Emeritus*; B.S., University of Idaho, 1936; Ph.D., 1968

CHRISTEN SKAAR (1946-1948) (1949-1976), *Professor Emeritus*; B.S., New York State College of Forestry, 1943; M.S., 1948; Ph.D., Yale University, 1957

GERALD H. SMITH (1946-1979), *Professor Emeritus*; B.S., New York State College of Forestry, 1937; M.B.A., Syracuse University, 1956

LEROY C. STEGEMAN (1929-1965), *Professor Emeritus*; B.S., Michigan State College, 1928; M.S., University of Michigan, 1929

VIVIAN R. SUTTON (1962-1976), *Associate Professor Emeritus*; B.A., Oberlin College, 1934; M.A., Bryn Mawr College, 1937; Ph.D., 1942

MICHAEL M. SZWARC (1952-1979), *Leading Professor Emeritus*; Ch.E., Warsaw Polytechnic College, 1932; Ph.D., Hebrew University, 1945; Ph.D., Manchester University, 1947; D.Sc., 1949

RALPH G. UNGER (1937-1964), *Professor Emeritus*; B.S., New York State College of Forestry, 1930

ARTHUR T. VIERTEL (1946-1975), *Associate Professor Emeritus*; B.S., New York State College of Forestry, 1942; Ph.D., 1954

WILLIAM L. WEBB (1937-1975), *Professor Emeritus*; *Dean Emeritus*; B.S., University of Minnesota, 1935; M.S., 1940; Ph.D., Syracuse University, 1950

FAY WELCH (1932-1967), *Lecturer Emeritus*; B.S., New York State College of Forestry, 1922

WALTER L. WELCH (1950-1965), *Associate Professor Emeritus*; A.B., Syracuse University, 1946

SIDNEY A. WHITT (1968-1976), *Professor Emeritus*; B.S., University of Alabama, 1933; M.S., Massachusetts Institute of Technology, 1937; D. Engr. Sc., New York University, 1962

HAROLD G. WILM (1953-1966), *Professor Emeritus*; *Associate Dean Emeritus*; B.S., Colorado College, 1929; M.F., Cornell University, 1930; Ph.D., 1932

LOUIS E. WISE (1919-1932), *Professor Emeritus*; B.A., Columbia University, 1907; Ph.D., 1911

Index

Academic Life 23
Academic Policies 37
—Undergraduate 38
—Graduate 40
Activities, Extracurricular 46
Adirondack Ecological Center 13, 18
Administration, College 185
Admission
—Advanced Early 24
—Undergraduate 24
—Graduate 27
—School of Forest Technology 121
Assistantships, Graduate 37
Athletics 47
Attendance, Class 37
Audits 37
Biology, Chemistry and Ecology, School of 52
Biology, Environmental and Forest 52, 57, 138
Board of Trustees
—ESF 184
—SUNY 181
Botany 140
Calendar, Academic 3
Campuses, Regional System of ... 15,17-18
Career Services 48
—School of Forest Technology 124
Cellulose Research Institute 14
Chemical Ecology 71
Chemistry 65, 144
—Biochemistry and Natural Products Option 67
—Environmental Chemistry Option 67
—Natural and Synthetic Polymer Option 68
Clubs and Organizations 46
College Proficiency Examinations 26
Commencement
—Fees 30
—Honors 39
Computer Center 17
Continuing Education 9, 175
Cooperative Research Unit, U.S. Forest Service 12
Cornell University 125
Counseling
—Academic and Personal 48
—Career 48
—Health 49
Course Offerings 127
Cranberry Lake Campus 50, 51
Credit Hour Load 38, 41
Correspondence .... Inside Front Cover
Degree Requirements
—Undergraduate 37
—Graduate 42
Ecology 57, 61
Economics, Forestry 93
Educational Communications Unit 16
Educational Opportunity Program 26
—EOP Grants 33
Ellis International Laboratory 19
Empire State Paper Research Institute 11, 15
Employment 36
Energy Conservation 118
Engineering 131
—Forest Engineering 74,149
—Paper Science and Engineering 78
—Wood Products Engineering 82
Entomology 56, 61, 150
Environmental
—and Forest Biology 52, 59
—and Resource Engineering,
—School of 72
—Assessment 117
—Biology Summer Program 57
—Education/Communications 116
—Influences 129
—Land Use Planning 117
—Physiology 62
—Policy 116
—Program Affairs, Institute of .. 11, 13, 15
—Science, Graduate Program in . 113, 130
—Studies 137
Exchange Programs 125
Expenses 28
—School of Forest Technology 122
Experiment Station 18
Extracurricular Activities 46
Faculty, College 186
Faculty Emeritus 200
Failures and Incompletes 39
Fees
—Application 28
—Advanced Payment 29
—Commencement 30
—Refunds 31
—Student Activity 30
Fellowships 35
Field Forestry Summer Program 54, 57
Financial Assistance 32
Fish and Wildlife Biology 56, 62
Food Service 46
Forest
—Biology 52, 59
—Engineering 74, 149
—Influences 99

—Management 88, 92
—Pathology and Mycology 56
—Technology, School of 119, 158
Forestry 153
—Economics 93
—International 99
—School of 87
—Urban 100
Genetic Field Station 17, 18
Grades/Grade Point Average 38
Grant Programs 33, 35
Graduation Requirements
—Undergraduate 40
—Graduate 45
Graphics 164
Health and Medical Services 49
—Health Examination Board 27
Heiberg Memorial Forest 17
History and Traditions, College 5
Honors, Academic 39
Housing and Board 46
—Cost of 30
Huntington Wildlife Forest 18
Institute of Environmental
Program Affairs 11, 13, 15
Instruction
—Continuing Education 9
—Graduate 8
—Professional 8
—Technical 8
Insurance, Health and Accident 49
Interdepartmental Areas of Study .. 71, 113
International Forestry Concentration 99
International Students
—Undergraduate 27
—Graduate 28
—Tuition Waivers 34
Landscape Architecture, School of 101, 164
Land Use Planning 117
Library 16, 165
—Film Library 14
Loans 36
Management 153
—Forest 88, 92
—Policy and Resource 91
—Recreation 94
Mathematics 128
Medical Services 49
Newcomb Campus 13, 15, 18
Pack Demonstration Forest 18
Paper Science and Engineering 78, 171
Pathology, Forest 56, 63
Pest Management 57
Physiology, Environmental 62
Placement 48, 124
Plant Science 56, 63
Policy and Administration 93
Polymer Research Institute 12, 15
Probation 38
Professional Staff 186
Public Service 14
Quantitative Methods 101
Recreation Management 94
Refunds 31
Regents Programs 34
Renewable Materials Institute 13
Research 10
Resources Management 153, 173
Resource Management and
Policy 91, 173
ROTC Program 50
Scholarships and Grants 33
Silvics 57, 97
Silviculture 98, 176
Silviculture and Forest Influences 95
Social Security Benefits 35
Soil
—Ecology 61
—Science 98
State University of New York 181
Student Life 46
Summer Field Programs 54, 57
—Cost of 31
Syracuse Campus, ESF 15
Syracuse Metropolitan Area 21
Syracuse University
—Counseling 48
—Health and Medical Facilities 49
—Housing and Board 30, 46
—Student Organizations 47
Transfer Students
—Admissions 25
—Credit 26
Tree Improvement 99
Tree Pest, Disease Service 14
Tropical Timber Information Center 14
Tuition and Fees 29
—Refunds 31
—School of Forest Technology 122
Tuition Assistance Program 34
Tully Campus 17
Ultrastructure Studies Lab,
N.C. Brown 12, 15
Urban Forestry Concentration 100
U.S. Forest Service Cooperative
Research Unit 12
Veterans' Benefits 35
Vocational Rehabilitation Grants 34
Wanakena Campus 17, 119
Warrensburg Campus 18
—Summer Session 54
Water Resources 117
Wildlife Biology 56, 62
Wood Products Engineering 82, 178
—Building Construction Option 83
—Forest Products Option 84
Work-Study Program 36
Zoology 56, 64, 161

Campus Locator

Admissions	110 Bray
Affirmative Action	218 Bray
Alumni	119 Bray
Analytical and Technical Services	139 Baker
Assistant Vice President for Academic Programs	227 Bray
Assistant Vice President for Research	200 Bray
Auto-tutorial Center	16 Moon
Business and Fiscal Affairs	100 Bray
Career Services	108 Bray
Cellulose Research Institute	314 Baker
Community Relations	123 Bray
Computer Services	320 Baker
Counseling Services	107 Bray
Educational Communications	302 Illick
Empire State Paper Research Institute	317 Walters
Facilities	Maintenance Building
Film Library	9 Moon
Financial Aid	111 Bray
International Forestry	205 Marshall
Institute of Environmental Program Affairs	200 Bray
Institutional Research	206 Bray
Library	101 Moon
Maintenance and Operations	Maintenance Building
Personnel	224 Bray
Polymer Research Institute	215 Baker
President	204 Bray
Publications	123 Bray
Registrar	113 Bray
School of Biology, Chemistry and Ecology	311 Baker
School of Continuing Education	231 Baker
School of Environmental and Resource Engineering	208 Walters
School of Forestry	106 Marshall
School of Landscape Architecture	331 Marshall
Security and Safety	8 Bray
Student Council	19 Marshall
Ultrastructure Studies Center	417 Baker
U.S. Forest Service Cooperative Research Unit	5 Moon
Veterans' Affairs	107 Bray
Vice President for Administration and Services	208 Bray
Vice President for Program Affairs	227 Bray
Vice President for Student Affairs	107 Bray

Coordinator for 503-504 Programs at the State University of New York College of Environmental Science and Forestry is David G. Anderson, Vice President for Administration and Services.

THE STATE UNIVERSITY OF NEW YORK
COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY
SYRACUSE, NEW YORK 13210

1981-82 Catalog

SUNY College of Environmental Science and Forestry

CORRESPONDENCE DIRECTORY

Detailed information about the College may be obtained by addressing inquiries to:

The State University of New York
College of Environmental Science and Forestry
Syracuse, New York 13210
(315) 470-6500

Admission (Undergraduates)
Director of Admissions
110 Bray Hall
470-6600

Graduate Studies
Office of Academic Programs
219 Bray Hall
470-6599

Financial Assistance
Coordinator of Financial Aid
109 Bray Hall
470-6670

Transcripts and Academic Records
Registrar
111 Bray Hall
470-6655

Housing
Coordinator of Undergraduate Housing
Office of Residential Life
Steele Hall
Syracuse University
Syracuse, New York 13210
423-2720

Additional information is available upon request from any of the above addresses. This undergraduate/graduate catalog was published by the College of Environmental Science and Forestry, June 1981.

The calendar, courses, tuition, and fees described in this catalog are subject to change at any time by official action either of the State University of New York Board of Trustees or of the College of Environmental Science and Forestry.

The State University of New York College of Environmental Science and Forestry does not discriminate on the basis of race, sex, religion, national origin, age, handicap, or marital status in admissions, employment, and treatment of students and employees.

State University of New York

COLLEGE OF

ENVIRONMENTAL SCIENCE AND FORESTRY

1981-82

General Catalog

TABLE OF CONTENTS

ACADEMIC CALENDAR 3

ESF: WHAT'S IN A NAME? 5

THE MISSION: INSTRUCTION, RESEARCH, AND PUBLIC SERVICE .. 8

THE CAMPUSES 15

THE SYRACUSE METROPOLITAN AREA 21

ACADEMIC LIFE 23

Undergraduate Admission 24

Admission Procedures 24

Graduate Admission 27

Expenses 28

Financial Assistance 32

Academic Requirements 37

Student Life 46

Degree Programs and Areas of Study 51

GRADUATE EXCHANGE PROGRAMS 131

COURSE OFFERINGS 133

STATE UNIVERSITY OF NEW YORK 187

COLLEGE TRUSTEES AND ADMINISTRATION 190

COLLEGE FACULTY AND PROFESSIONAL STAFF 192

INDEX 210

CAMPUS LOCATOR .... Inside Back Cover

Academic Calendar

SYRACUSE CAMPUS

FALL 1981

Registration	September 9, 10	Wednesday, Thursday
First Day of Classes	September 11	Friday
Rosh Hashanah	September 29	Tuesday
Yom Kippur	October 8	Thursday
Thanksgiving Vacation	November 25-29	Wednesday-Sunday
Last Day of Classes	December 15	Tuesday
Reading Day	December 16	Wednesday
Exam Period	December 17-23	Thursday-Wednesday

SPRING 1982

Registration	January 12, 13	Tuesday, Wednesday
First Day of Classes	January 14	Thursday
Spring Recess	March 6-14	Saturday-Sunday
Last Day of Classes	April 28	Wednesday
Reading Day	April 29	Thursday
Exam Period	April 30—May 6	Friday-Thursday
Commencement	May 8	Saturday


STATE
OF NEW
COLLEGE OF
ENVIRONMENTAL
SCIENCE AND

ESF: What's In A Name?

1911. Governor John A. Dix signed a bill establishing the New York State College of Forestry at Syracuse University.

1948. Legislative action incorporated into State University of New York all state-supported higher education. Thus, the State University College of Forestry at Syracuse University.

1972. By special legislative act, the College was renamed the State University of New York College of Environmental Science and Forestry.

Why, in the first place, all the name changes? And, secondly, what difference do they make? What, really, is in our name?

ESTABLISHING A TRADITION

While a professional forestry education in this country is almost entirely a development of the twentieth century, its primary roots can be traced back as early as 1862 when Congress passed the Morrill Act establishing a system of land-grant colleges.

The growing importance of forests in America's economy was reflected in the 1870 census, when, for the first time, information on forest resources was included. Several attempts to establish a national school of forestry were made; while none was approved, the movement shows that there was considerable demand for professionally trained foresters.

By 1900 there was a spirit of reform in the country—the same spirit that produced the early muckrakers also produced a generation interested in the conservation, preservation and careful management of precious natural resources. Between 1903 and 1914, 21 schools of forestry were established.

The first college of forestry in this country to offer a full, four-year undergraduate program was established in 1898 at Cornell University. Under the leadership of Bernard E. Fernow, students were introduced to critical field experience in their junior and senior years at the college's 30,000-acre forest in the Adirondack Mountains. There, Fernow taught many experimental management practices, including clear-cutting and surface-burning. These techniques have always been controversial, and they aroused criticism by the wealthy summer residents in adjacent areas of the Adirondacks. After only five years of operation, the Cornell College of Forestry was closed in 1903 when the state Legislature, yielding to the influential property owners, ended fiscal support.

The beginnings and early development of the New York State College of Forestry were largely due to James R. Day, chancellor of Syracuse University, and community leaders who were attuned to the growing national

sentiment favoring forest conservation and who sensed the need for a professional school of forestry. The legislative act which created the College instructed that the institution "conduct such special research in statewide investigations in forestry as will throw light upon and help in the solution of forestry problems. . ." and that it be "the institution for educational work in forestry in the State."

From the very first years of its existence under the first dean, Hugh P. Baker, the College responded to the broad needs of environmental professionalism. While other schools and colleges of forestry became more specialized, the College at Syracuse broadened to include the essentials of environmental science: design, engineering, and the life sciences, as well as resource management.

BROADENING THE BASE

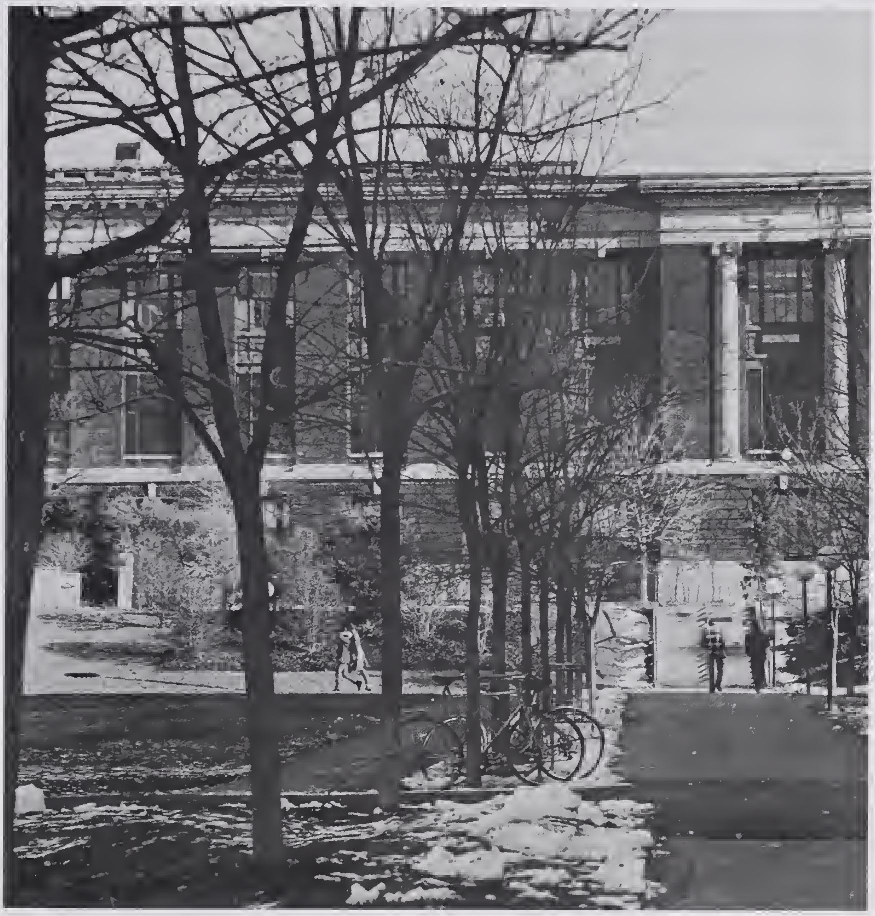
With the formation of the State University of New York in 1948, coordination and systematization came to higher education in the state. The University, according to its charter, was to "supplement, not supplant, the great network of private colleges and universities." The College of Forestry, which from its beginning had been state-supported and governed by a Board of Trustees currently made up of nine members appointed by the Governor and six *ex officio* members, was recognized as a specialized college within the State University system.

Stemming from Chancellor Day's early sponsorship of the College, Syracuse University and ESF have long been engaged in numerous fruitful devices of institutional cooperation. This relationship is probably the most outstanding example in this country of collaboration between public and private institutions of higher education. Even as a part of State University, the College maintains this unique position. The major character of the relationship stems from the fact that since its beginning, the College purchased from Syracuse University the major portion of its supportive and enrichment instruction, thus allowing the College to more fully develop its professional upper division and graduate level instruction.

Other cooperative areas are living centers and dining facilities, athletic programs, the use of the University's infirmary and health counseling services, the bookstore facilities, the University library system, and participation in numerous social activities including the elaborate religious, dramatic, and cultural benefits of a large university.

ESF TODAY

The third phase in the evolvement of the College's name came in 1972 when it was rechartered as the State University of New York College of Environmental Science and Forestry. Thus, the name reflects more deeply the traditional grounding and concern of forestry in the environment; it illuminates more clearly the capabilities of its program.



The College of Environmental Science and Forestry has completed a plan, conceived more than 10 years ago, to achieve complete upper division/graduate status. Undergraduate students wishing to embark upon a career in the environmental sciences and forestry will enroll for two years at a junior college or four-year institution, studying an ESF prescribed program and transfer to this college as juniors. The move to upper division/graduate college status marks another step in the College's long-standing commitment to educate professionals capable of facing the complex environmental problems of today and of the future.

For more than 70 years, the full thrust of the State University of New York College of Environmental Science and Forestry has been focused on the environment on all of its six campuses and in each of its three mission areas—instruction, research, and public service. The College has been, and continues to be, devoted to the advancement of environmental science and forestry.

The Mission: Instruction, Research, and Public Service

INSTRUCTION

In the fall of 1980, student enrollment reached 1,759. Of this number, 1,260 were undergraduates and 499 were graduate students. In addition, there were 11 students engaged in postdoctoral work.

Undergraduate Education

At the baccalaureate level, the College offers professional study in eight areas: chemistry; environmental and forest biology; environmental studies; *forest engineering; paper science and engineering; wood products engineering; resource management;* and *landscape architecture*. These programs are registered with the New York State Education Department.

Each of these curricula leads to the bachelor of science degree. In the case of landscape architecture, an additional year of study results in a bachelor of landscape architecture degree, and in the forest engineering program, a fifth year leading to a bachelor's degree in civil engineering can be taken at Syracuse University or State University at Buffalo.

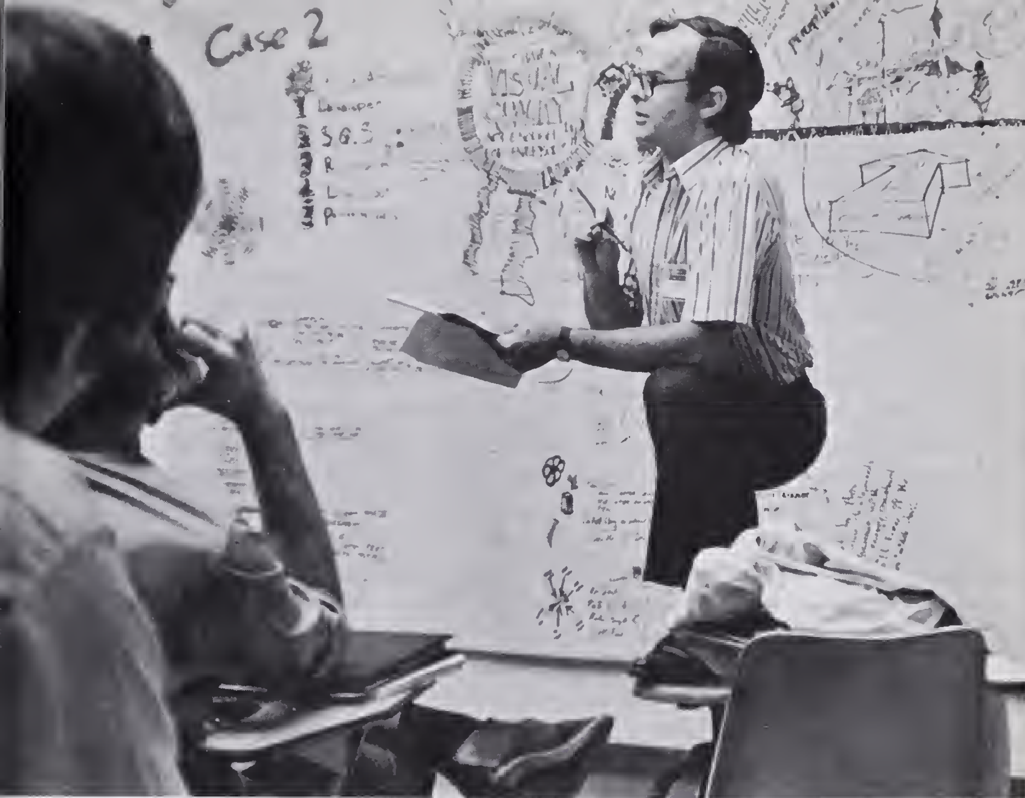
Graduate Education

The College awarded its first graduate degree in 1913. Today the College offers advanced degrees in seven major program areas: *environmental and forest biology, chemistry, resource management and policy, silviculture and forest influences, environmental and resource engineering, landscape architecture, and environmental* science. These programs are registered with the New York State Education Department.

Graduate study leads to the master of science degree, the master of landscape architecture degree, and the doctor of philosophy degree. A postdoctoral study program, closely related to the College's research effort, is also available.

Technical Education

At the paraprofessional level, the College has been training forest technicians since 1912 at its Wanakena Campus in the Adirondack



Mountains. It is the oldest Ranger School in the United States and offers a two-year *forest technology* curriculum. Graduates are awarded an associate in applied science degree. In this curriculum, students take their first year of general education at a two- or four-year college. The second year, with its emphasis on practical field training in the relationships between forest technology and managerial needs, is taken at Wanakena with its 2,800 acres of forested land. Graduates of this degree program in practical forestry are prepared for positions as forest rangers; federal, state, and private industry forest technicians and forestry aides; district forest supervisors; timber inventory specialists; timber sales supervisors; forest surveyors and engineering aides; and forest protection technicians.

Continuing Education

The philosophy that education is a lifelong pursuit is an ancient one and was written into the law creating the College. This concept is doubly important to the sciences and professions in this technological age when, with knowledge expanding in all directions, major environmental problems still remain to be resolved. The informational needs of New York's citizens also are undergoing change. The increasing urban character of our population; the changing pattern of agricultural and forest land ownership and use; the rise in level of education and sophistication in a more efficient society; and the increase in leisure time, travel mobility and need for recreational facilities and pursuits all contribute to a growing need for educational opportunities in environmental science and forestry for adult audiences.

The College has, over the years, succeeded in communicating knowledge on forest resources management, utilization, and conservation to a variety of off-campus publics. The entire College faculty has contributed to these programs. To reinforce this commitment, the College established a School of Continuing Education upon which to base expanded educational opportunities at both the undergraduate and graduate course levels.

Conferences, symposia, seminars, and shortcourses on various aspects of forestry and the related sciences are conducted at both the basic and applied levels. Audiences include forest owners, managers, and operators; wood engineers and forest industries personnel; academic and scientific groups; conservation and recreation personnel from local and other public and private planning groups; and citizen-action committees. Upon request, continuing education programs can be designed to meet specific needs of professional organizations, agencies, and industry. Credit or noncredit courses, at campus or off-campus sites, can be arranged.

Expansion of "in-service" training courses, establishment of "environmental learning centers" on College forest properties, and production of media materials for public information and education are examples of activities directed toward updating and upgrading professional clients and broadening the public's awareness and appreciation of New York's forestlands and other natural resources.

For information on specific continuing education projects, inquiries should be sent to Dean, School of Continuing Education.

RESEARCH

The College's commitment to scientific inquiry stretches far back to its second year of existence. In 1912, Dean Hugh P. Baker initiated the first research project of the College by joining forces with the U.S. Forest Service in an industry study designed to show what kinds of firms were using wood in New York State and the species and quantities of lumber they used.

In the 1980's, the College's research program has attracted a worldwide clientele of industrial, governmental, professional and scientific groups, and through liaison with them, the program maintains its vigor and relevancy to the important environmental issues of the decade. Support from this clientele amounts to about $4.5 million a year, a four-fold increase in the last decade.

Students and faculty from across the College contribute to the depth and diversity of the research program. Findings from these studies are applied to a host of issues and problems through various demonstrations and information devices. Recent examples include studies of limestone quarry reclamation; the development of polymeric materials for artificial human organs; nonchemical control measures for insect pests, e.g., the gypsy moth; studies of the ecology of Antarctic birds; new wood pulping processes leading to pollution-free water and air effluents; and the ecological effects of winter navigation in the Great Lakes and the St. Lawrence River.

The Institute of Environmental Program Affairs

The Institute of Environmental Program Affairs (IEPA), created at the College in 1972, is an umbrella-like structure that coordinates the overall research effort of the College with the efforts of other academic institutions, public agencies and private industries for a concerted attack on compelling and complex environmental problems. IEPA expands the College's ongoing examination of its appropriate role as a leader in environmental education for the 1980's and beyond in face of urgent appeals for multidisciplinary approaches, for problem-oriented task forces by both faculty and students, and for the greater application of higher education to society's needs. Because it is a process, the Institute preserves the identity of each collaborator: institutions, faculty members and students come together for just as long as necessary to solve a problem, then return to other ongoing areas of interest. Important projects have included: resource and environmental studies for the St. Lawrence Eastern Ontario Commission, and the Tug Hill and Catskill study commissions; a study of wetlands evaluation systems for the Adirondack Park Agency; development of environmental impact assessment guidelines for the New York State Department of Environmental Conservation; a study of selected environmental impacts of possible nuclear power developments in New York State for the Argonne National Laboratory; and studies of the St. Lawrence River ecosystems and impacts of oil spills and extension of the shipping season for the U.S. Environmental Protection Agency and the U.S. Fish and Wildlife Service, respectively.

Additional projects include an analysis of the effects of acid precipitation on terrestrial ecosystems, reclamation studies of mines and quarried lands, and biomass potentials for energy production. Work is also anticipated in the areas of stream channel response to land use changes and social and political factors affecting disposal of sewage on land areas.

Empire State Paper Research Institute

The Empire State Paper Research Institute (ESPRI), located on the main campus, is the only worldwide basic research organization in the pulp and paper field. It performs investigations in cooperation with the Empire State Paper Research Association (ESPRA), which is comprised of 78 pulp and paper companies in 14 countries. The Institute was established in 1945 when the members of ESPRA recognized the need for new scientific and technical knowledge and methods, and since then ESPRI has been able to maintain an efficient balance between the practical and theoretical bases of the pulp and paper industry.

Housed in the modern J. Henry Walters Hall with its own pilot paper mill, and staffed by scientists who are internationally recognized for their accomplishments, ESPRI provides a research base for long-range industry development. Its program has widened in scope to cover almost all aspects of pulping and papermaking, including additive retention, oxygen pulping and bleaching, effluent control, sheet drying, printability, and energy efficiencies.

Polymer Research Institute

Scientists at the College have made many original contributions to the field of pure and applied polymer chemistry, including the development of living polymers, the study of anionic polymerization and electron-transfer initiation, and work on the permeation of gases and films through polymeric films.

College faculty members specializing in polymer chemistry have trained several hundred graduates and postdoctoral researchers, many of whom now hold leading positions in universities and industrial and governmental laboratories.

Nelson Courtlandt Brown Laboratory for Ultrastructure Studies

This Center, located in Baker Laboratory, is a teaching, research, and service facility of the College. It is equipped to handle virtually every type of modern microscopy. This includes light, scanning electron, and transmission electron microscopy. Among the major items of equipment are: two RCA EMU-3 transmission electron microscopes; an RCA EMU-4, an ETEC Autoscan scanning electron microscope, energy dispersive X-ray analyzer, several types of light microscopes, high vacuum evaporators, microtomes and ultramicrotomes. The laboratory resources include specimen preparation rooms, several photographic darkrooms, three electron microscope laboratories and other supporting facilities.

The primary service of the Center is teaching; course offerings include photomicrography, scanning electron microscopy, and interpretation of cellular ultrastructure. Research is a second major activity since support is provided for students, faculty, and research staff who have projects involving structural studies. Public service is extended to local high school groups, medical facilities, other regional colleges and universities, and industry.

Adirondack Ecological Center

The Adirondack Ecological Center (AEC) is located on the College's Newcomb Campus in the center of the Adirondack Mountains. Staffed by resident scientists, technicians, and support staff, the AEC conducts studies of the Adirondack region year-round. Research includes studies of managed and unmanaged forest lands, wildlife populations and habitats, terrestrial and aquatic ecology, and wilderness management. Work is carried on in close collaboration with the New York State Department of Environmental Conservation, the U.S. Fish and Wildlife Service, the U.S. Department of Agriculture, and forest industries.

The vigorous research program of the Center provides excellent opportunities for collaboration by Syracuse-based faculty and students. Several graduate students are regularly in residence at Newcomb pursuing their thesis research.

Renewable Materials Institute

The Renewable Materials Institute (RMI) has as its principal goal research on wood and other renewable materials such as agricultural waste products, which would include straw, rice hulls, and bagasse. To meet its mission, research on the characterization of the material itself is primary. Closely related with it is the determination of physical properties which control the behavior of the material during utilization as well as in use in consumer products. In exploring renewable materials, strong emphasis is placed on energy considerations. This can be in terms of energy savings during production or economies of energy because of the use of the end product in housing or in some other application. Also included are related studies in the combustion of wood, the efficiency of heating with wood and the emissions resulting from wood combustion.

The principal facilities for the materials characterization are found in the Center for Ultrastructure Studies and include the transmission electron microscopes, a scanning electron microscope with EDXA and rapid particle analysis. All of the facilities of the Department of Wood Products Engineering are also available, including a sawmill, veneer and plywood manufacturing facility, dry kilns, wood machining equipment, and timber testing laboratory. The facilities of other research institutes and Departments in the College are also available for special projects.

Tropical Timber Information Center

The Tropical Timber Information Center (TTIC) provides identifications of wood samples and information about tropical woods for both general characteristics and technical properties. These services are oriented toward importers and users of tropical woods. The Center began operation in 1975 as part of the Department of Wood Products Engineering and is one of only two such sources of information in the western hemisphere. The Center also carries out special studies under contract for production of data that is not available in the literature. The technical base for operation of the Center is a large, worldwide collection of authenticated wood samples and an extensive collection of reference materials in Moon Library and the Department of

Wood Products Engineering. Both of these resources have been built up over the past 60 years by close cooperation with institutions throughout the world. Activity of the Center is primarily oriented toward requests for services from importers and users of tropical woods and to the expansion of the reference collections of wood and library materials.

Cellulose Research Institute

Research at the Cellulose Research Institute is at present centered on the fine structure of native cellulose and its transformations into other commercially important forms of cellulose. For example, the structural differences between native and regenerated celluloses have been determined, for the first time, through x-ray crystallographic studies. The same techniques are now being used to study the structural aspects of cellulose mercerization, an important commercial process in cellulose chemistry. Other recent research has been concerned with the organization, chemical composition, and function of the vascular cambium in trees, the ultimate source of all wood and bark produced in nature.

U.S. Department of Agriculture—Forest Service Cooperative Research Unit

The Northeast Forest Experiment Station of the U.S. Department of Agriculture-Forest Service maintains a research center at the College. Until 1977, this unit pursued studies of forest-centered recreation with the aim of developing improved methods for integrating recreation and other uses of forests.

Beginning in 1978, the Cooperative Research Unit was re-oriented to research on urban environmental forestry problems. This provides increased opportunities for faculty and students to collaborate with Forest Service scientists in studies of a variety of urban and environmental problems.

PUBLIC SERVICE

The College, throughout its 69-year history, has continued to respond to its specific legislative mission prescribing major responsibilities in the area of public service. Public education and information, technical advice and guidance to cooperating local, state, and federal agencies and organizations, and technical assistance to the forest and wood-using industries constitute the principal formal public service activities. The Institute of Environmental Program Affairs (described in the Research section) coordinates the College's public service activities on the professional level.

While the list of public service contributions is lengthy, a few examples include: the College's Film Library; the Tree Pest and Disease Service, which provides technical advice to private citizens and to governmental agencies; and the participation of ESF faculty members in Central New York's Poison Control Center. Altogether, the public service programs of the College reach approximately one million New York State residents each year.

The Campuses

The College operates a multiple campus system with regional campuses and field stations located at Syracuse, Tully, Wanakena, Warrensburg, Cranberry Lake, Newcomb, and Clayton. This system, composed of about one million square feet of facilities in 186 buildings and 25,000 acres of land, represents the largest fully-utilized campus in the world.

THE SYRACUSE CAMPUS

The main campus is in Syracuse and lies on 12 acres adjacent to Syracuse University in an area that traditionally has been known as "The Hill." Located here are the Schools of Biology, Chemistry, and Ecology; Environmental and Resource Engineering; Forestry; Landscape Architecture; and Continuing Education. In addition, the main campus houses the Institute of Environmental Program Affairs, the Empire State Paper Research Institute, the Polymer Research Institute, a cooperative research unit of the USDA Forest Service, the Ultrastructure Center, the Graduate Program in Environmental Science, and the Renewable Materials Institute.

These program units are housed in five major academic buildings (Baker Laboratory, and Walters, Bray, Marshall and Illick Halls). The main campus also includes Moon Memorial Library, the Maintenance Building and several other small service and storage facilities.

Specialized facilities at the Syracuse campus include electron microscopes, plant growth chambers, air-conditioned greenhouses, an animal environmental simulating chamber, a bio-acoustical laboratory, a 1,000-curie cobalt-60 radiation source, radioisotope laboratory, computing center, and specialized instrumentation including nuclear magnetic resonance spectrometers, electron spin resonance spectrometer, gas chromotography, mass spectrometer, ultracentrifuge, and X-ray and infrared spectrophotometer. Photogrammetric and geodetic facilities of the forest engineering department include one of the most extensive arrays of equipment in the United States, with a Nistri TA-3 stereocomparator, Mann comparator, computerized Nistri photocartograph, and nine other varieties of plotters. The paper science and engineering laboratory has a semicommercial paper mill with accessory equipment. The wood products engineering department has a complete strength-of-materials laboratory as well as a pilot scale plywood laboratory and a machining laboratory. The greenhouses and forest insectary are used to produce plant and insect material for classroom and laboratory. Extensive collections are available for study, including wood samples from all over the world, botanical materials, insects, birds, mammals, and fishes.

The **F. Franklin Moon Library** contains more than 80,000 cataloged items. Over 800 journals and corresponding indices are currently received. The collections constitute an information center for forestry and environmental science programs in ecology, botany and pathology, biochemistry, chemical ecology, forest chemistry, polymer chemistry, economics, entomology, environmental studies, industrial pollution abatement, landscape architecture, environmental design, management, paper science and engineering, photogrammetry, silviculture, soil science, water resources, world forestry, wildlife biology, wood products engineering, and zoology. These are supplemented by large collections in the environmental resource field. Additional strength is found in the comprehensiveness of abstract and indexing services relevant to the College's programs.

The collections of Syracuse University libraries and State University Upstate Medical Center are within walking distance. They may be used by all members of the College of Environmental Science and Forestry. Arrangements often can be made to use industrial libraries in the Syracuse area. Other collections from throughout New York State and the United States are accessible through Inter-library loan privilege.

The library building, opened in 1968, can accommodate 132,000 volumes and can seat 575 persons. The main reading areas are in the center of the upper level, surrounded by open stacks. The library contains a current periodicals room, bibliographic center, individual study carrels, and library staff offices. The archives, special collections, conference rooms, autotutorial center, and informal study rooms are located on the lower level.

Leisure reading material, distributed throughout the total collection, represents the Robin Hood and Raymond F. Crossman collections, which contain books on national and world social problems, humanities, education, and popular books concerned with the environment. The archives consist of historical items relevant to the College and forestry developments in New York State. The special collections room contains rare and valuable books and folios.

Reference service, orientation, and bibliographic instruction (Library Research 300) are provided by the librarians. Study guides, user aids, and other such publications are prepared and distributed by the librarians as needed.

The **Educational Communications** unit directly supports the program areas of the College through development and application of media materials and methods for the classroom, for the presentation of research findings, and for public service endeavors. These include television programming, slide/tape and motion picture production and photographic services. Other services to the College community include engineering, audio-visual equipment distribution, and maintenance and support functions. The Educational Communications staff also participates directly and actively in instructional programs in environmental communication at both the undergraduate and graduate levels, as well as through the School of Continuing Education.

The College **Computer Center** provides computational service in several forms. The primary source is via remote communication with the facilities at Syracuse University which consist of an academic computer center and an administrative center. The academic facilities permit both batch and interactive processing on one of three processors—two IBM 4341's and one DEC-KL10; the administrative facilities service the data-processing needs of ESF with an IBM System/370 model 158. Extensive software is available for the academic user in the form of most of the major languages—Fortran and APL finding the heaviest usage—and most of the major applications packages for statistics, graphics, text editing, and general mathematical needs. In addition to the centrally supplied services described above, there are numerous micro-computer facilities being established for specialized needs in chemistry, engineering, remote sensing, forestry and other related and supporting fields.

THE TULLY CAMPUS

Located about 25 miles south of Syracuse is the Tully Campus which is composed of the Heiberg Memorial Forest and the Genetic Field Station.

Heiberg Memorial Forest is located on the northern escarpment of the Allegheny Plateau. It includes 3,800 acres of diverse terrain and forest growth. The Forest is utilized both as an extensive outdoor teaching laboratory and as a site for intensive research. The **Forest Ecosystem Lab**, which is a highly instrumented outdoor teaching laboratory, a large complex of all-weather classrooms, many experimental plantings from throughout the world, a commercial-scale maple syrup operation, and an experimental deer research area are among the developments on this forest. Each fall the Heiberg Memorial Forest is the site of an intensive program for environmental and resource management students in a total ecosystem approach to forest community management instruction.

THE WANAKENA CAMPUS

The Wanakena Campus, located on the Oswegatchie River, 65 miles northeast of Watertown and 35 miles west of Tupper Lake, is the site of the **James F. Dubuar Forest** and the **School of Forest Technology**. This campus, with its large instructional and demonstration forest, supports the College's associate degree program for the training of forest technicians. This is the oldest forest technician school in the country. This campus is situated on the western plateau of the "lakes region" of the Adirondacks.

In addition to its full academic program, this campus hosts various summer short courses in forest biology and forest technology.

THE WARRENSBURG CAMPUS

The Warrensburg Campus is located in the southeastern Adirondack region and encompasses the **Charles Lathrop Pack Demonstration Forest**, an area of roughly 2,500 acres of heavily forested land noted for its white pine. The Forest has been under intensive management since 1927 for the combined purpose of instruction, research, and demonstration in forestry and allied fields.

Each year this campus hosts the Summer Session in Field Forestry, a five-week course devoted to introductory instruction in field forestry principles and techniques. The course is required of all entering students in Environmental and Resource Management and is open to election by students in Environmental and Forest Biology.

Formal offerings in Continuing Education and various meetings and conferences are also held here for practicing professionals and organizations directly associated with forestry and allied environmental fields.

THE CRANBERRY LAKE CAMPUS

The Cranberry Lake Campus, approximately 1,000 acres of forested property situated in the northwestern section of the Adirondack Mountains of northern New York State, is the site of the College's **Biological Station** where the College operates a ten-week summer field program in environmental biology. The campus is bounded by 150,000 acres of New York State forest preserve lands, by Cranberry Lake and by isolated forest bogs and beaver meadows.

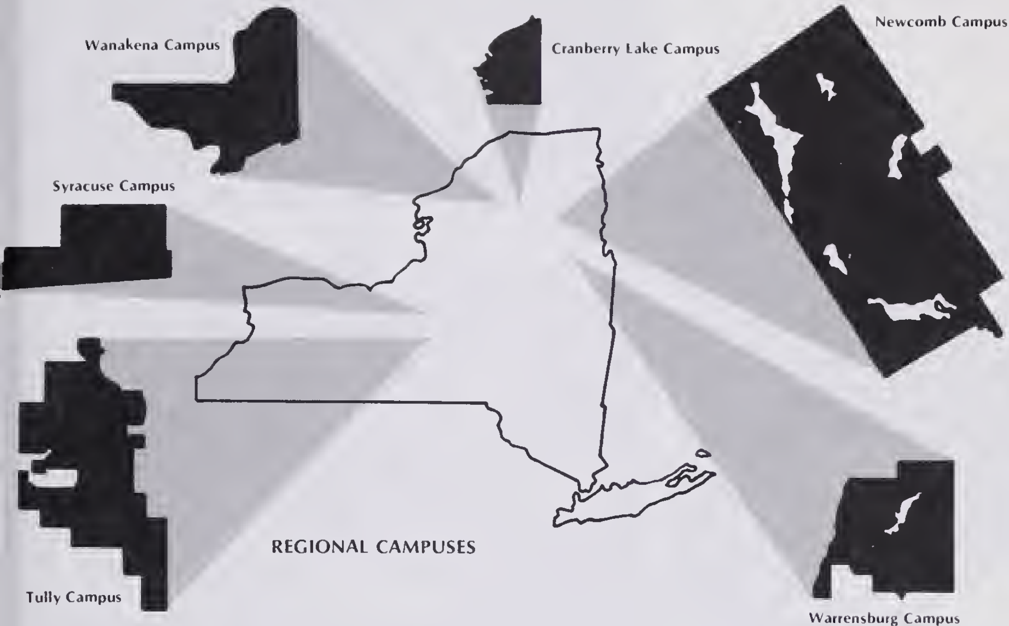
The extensive facilities are intensely utilized in a comprehensive curriculum of upper-level and graduate courses.

Use of this campus before and after the summer session program varies to include individual research projects, cooperative studies with other agencies and visits by large groups from both the College and outside institutions.

THE NEWCOMB CAMPUS

Located in the central Adirondack Mountains, Newcomb is the largest of the regional campuses and home to the **Adirondack Ecological Center** where extensive studies of animal biology and ecology are carried out. Also located there is **The Archer and Anna Huntington Wildlife Forest** which is about 15,000 acres in size.

This campus is of mountainous terrain and contains a variety of vegetative types and wildlife. The campus is used year round for a general research and forest management program participated in by faculty, graduate students, and visiting scientists.



THE FIELD STATIONS

In addition to its regional campus system, the College operates several field stations which directly support the instruction, research, and public service programs of the institution. The 44-acre **Forest Experiment Station**, located only a few minutes drive from the main campus in Syracuse, is used to support main campus academic programs. Located at the Station are a large arboretum, tree nursery, and experimental greenhouse facility. Adjacent to the Tully Campus is the College's **Genetic Field Station**. It is a 59-acre area devoted to relatively short-term outplantings of plant materials developed in the various genetic research projects of the College. With its irrigation system and layout of level blocks, it is an excellent facility for developing hybrids, for grafting, doing experiments, and for research in heritability. A magnificent island, the **Ellis International Laboratory**, is situated in the heart of the Thousand Islands—St. Lawrence River area off the village of Clayton. Accessible only by boat, this laboratory is an unusually appropriate site for the College-wide, cooperative and international, environmental monitoring and research activities of the St. Lawrence Seaway area. The College's most recent acquisiton is a 15.2-acre facility on **Wellesley Island**. This island property, formerly a Coast Guard Station, has short frontage on the American channel of the St. Lawrence Seaway. It is ideally suited for aquatic studies of many types.


Larry's
PIZZA
SANDWICHES
TAKE OUT & DELIVERY
OUR SPECIALTY

The Syracuse Metropolitan Area

The College of Environmental Science and Forestry is located on one of several hills that overlook Syracuse, a growing metropolitan area of nearly 500,000. Known as the "Salt City" because of the great salt industry which was centered here for more than seventy years, Syracuse is today a city of diversified industry and commerce. The area is a leader in the manufacture of china, quality shoes, air conditioning equipment, medical diagnostic equipment, drugs, automotive parts, and lighting equipment.

The City of Syracuse offers students many cultural, recreational and educational opportunities, including a symphony orchestra, several museums, live theater and historical points of interest.

Called the "Crossroads of New York State," Syracuse is one of the few cities in the nation situated at the crossing point of two major super-highways. It is located at the intersection of the 500-mile east-west New York State Thruway and the north-south Penn-Can Highway. Driving time from New York City, Philadelphia, Boston, Toronto and Montreal is about five hours; from Buffalo and Albany about three hours. The city is served also by a modern international airport and major bus and rail lines.

Academic Life

Society is increasingly in the hands of those who have broad foresight and a balance of judgment in applying scientific, sociological, and technical knowledge to guide human and environmental forces. Modern civilization—with its compelling demands from industry, government, and educational institutions—requires people who think objectively and constructively, and who act creatively and responsibly.

From its beginnings in 1911, the State University of New York College of Environmental Science and Forestry has served New York State and the nation in meeting the needs of its citizens in regard to the environment through education, research, and public service. The faculty and students of the institution are committed to the resolution of immediate environmental problems, the development of the knowledge necessary to predict occurrences in the future, and the presentation of public policy alternatives that will both protect the environment and accommodate the real needs of society.

At the undergraduate level, ESF offers curricula in the general areas of resource management, engineering, environmental design, and the physical and life sciences that prepare graduates to enter and contribute to the professional world or to continuing their education at the graduate level, at ESF or elsewhere.

Graduate years are a time of discovery and excitement, a time of answers and new insights, a time of personal productivity and contributions to scholarship. It is during graduate education that the student sharpens the ability to think critically and analytically, to plan research, to design experiments, to work effectively with the basic research tools as well as specialized equipment, and to undertake the discipline of purposeful study toward a specific goal.

The College currently supports significant graduate degree programs in six discipline areas and in its broad program in Environmental Science, which encourages multidisciplinary study. Both undergraduate and graduate programs of the College reflect the work of its faculty and their student colleagues, who, together, utilizing some of the most modern facilities and laboratories in the country, maintain a long-standing tradition of academic and professional excellence.

This catalog provides an introduction to the College and its programs of undergraduate and graduate study and research. It only begins to suggest the diversity and depth of the existing and potential programs that make environmental science the challenge of the 1980's and beyond.

UNDERGRADUATE ADMISSION

The College of Environmental Science and Forestry is an upper division/graduate center, enrolling at the undergraduate level transfer students who have completed at least two years of postsecondary coursework. Outstanding high school seniors can assure their acceptance by the College as junior transfers by applying to the Advanced Early Admission program.

Freshman and sophomore level courses may be taken at any two- or four-year college or university; all students considering transfer to ESF as juniors should follow the prescribed program appropriate to their intended major at the College. Each curriculum offered at the College of Environmental Science and Forestry and listed in this catalog defines the required lower division courses necessary for admission. These requirements are listed in the Areas of Study section of the catalog.

Students who are certain they intend to transfer to ESF may enroll in established pre-environmental science programs organized by the College in cooperation with a number of two- and four-year colleges in and out of New York State. Students who attend these colleges will find a smooth articulation has been established and upon successful completion of these prerequisites will generally gain admission to the college with full junior status. It is not required to specifically attend one of these colleges; a student may obtain the necessary lower division courses at almost any college or university in the country.

Application to ESF's associate degree program in Forest Technology at the Wanakena Campus must be made one year in advance. Therefore, high school students desiring to attend the Wanakena program in 1983 must apply this year. For further information on ESF's School of Forest Technology, see page 125, or contact the Office of Admissions.

ADMISSION PROCEDURES

ADVANCED EARLY ADMISSION PROGRAM

High school students who are strongly motivated toward attending ESF may apply to the College of Environmental Science and Forestry during their senior year under the *Advanced Early Admission Program.*

Those seniors whose academic background is successfully competitive will receive a letter of acceptance to the College for entrance two years later with full junior status, contingent upon successful completion of all prerequisite courses of the first two years of the curriculum to which they have been admitted. The prerequisite courses will be outlined and described in an enclosure with the acceptance letter.

This early acceptance will alleviate much of the anxiety about admissibility. High school seniors will know prior to graduation if they have been accepted to the College for entrance at the junior level. It affords those accepted students the opportunity to attend any college of their choice that offers the appropriate lower division courses. SUNY applications for the Advanced Early Admission Program may be obtained from high school guidance offices in New York State or directly from the Office of Admissions at ESF.

TRANSFER ADMISSIONS

For those students not accepted under the Advanced Early Admission Program, admission to the College of Environmental Science and Forestry is based on the student's previous college coursework, overall academic aptitude, and interest in the programs offered at this College. Consideration is given to both the quality and appropriateness of the student's prior academic experience. The minimum grade point average for acceptance is 2.0 (4.00 = A).

PRE-ESF COOPERATIVE TRANSFER PROGRAMS

The College, working in cooperation with other collegiate institutions, both in and out of New York State, has developed over 52 pre-environmental science and forestry programs. The development of these programs illustrates that high school students can look forward to a wide selection of colleges in which they can obtain all the necessary lower division courses and appropriate advisement to transfer to ESF as full juniors.

These colleges represent the total spectrum of higher education (private, public, 4-year, 2-year) and are located in New York, Connecticut, Massachusetts, New Jersey, Pennsylvania, Rhode Island, Iowa, and Maryland. Students who attend these colleges will find a smooth articulation has been established and once they transfer to ESF will share a common academic background with other transfer students.

Currently, the list of cooperating colleges includes:

New York State Colleges

Adirondack Community College, Glens Falls
Broome Community College, Binghamton
Canisius College, Buffalo
Cayuga County Community College, Auburn
Columbia-Greene Community College, Hudson
Community College of Finger Lakes, Canandaigua
Corning Community College, Corning
Dutchess Community College, Poughkeepsie
Erie Community College, Buffalo
Genesee Community College, Batavia
Herbert H. Lehman College, Bronx
Herkimer Community College, Herkimer
Hudson Valley Community College, Troy
Jamestown Community College, Jamestown
Jefferson Community College, Watertown
LeMoyne College, Syracuse
Mohawk Valley Community College, Utica
Monroe Community College, Rochester
Nassau Community College, Garden City
Niagara County Community College, Sanborn
North Country Community College, Saranac Lake
Onondaga Community College, Syracuse
Orange Community College, Middletown
Paul Smith's College, Paul Smiths
Rockland Community College, Suffern
Siena College, Loudonville
Suffolk County Community College, Selden
Sullivan County Community College, Loch Sheldrake

SUNY Alfred Ag. & Tech., Alfred
SUNY Canton Ag. & Tech., Canton
SUNY Cobleskill Ag. & Tech., Cobleskill
SUNY Delhi Ag. & Tech., Delhi
SUNY College at Geneseo, Geneseo
SUNY Morrisville Ag. & Tech., Morrisville
SUNY New Paltz, New Paltz
SUNY College at Oswego, Oswego
Syracuse University, Syracuse
Tompkins Cortland Community College, Dryden
Ulster County Community College, Stone Ridge
Westchester Community College, Valhalla

Out-of-State Colleges

Berkshire Community College, Pittsfield, MA
Camden County College, Blackwood, NJ
Garrett Community College, McHenry, MD
Holyoke Community College, Holyoke, MA
Housatonic Community College, Bridgeport, CT
Keystone Junior College, LaPlume, PA
Kirkwood Community College, Cedar Rapids, IA
Mercer County Community College, Trenton, NJ
Middlesex Community College, Edison, NJ
Ocean County College, Toms River, NJ
Roger Williams College, Bristol, RI
Union College, Cranford, NJ

TRANSFER CREDIT

Courses transferred for credit must be appropriate to the student's curriculum choice. Credit will be awarded for all such courses completed with a passing grade of "D" or better.

Furthermore, courses to be transferred as required courses in a curriculum must be acceptable in content. Course credit hours are transferred, but grades and grade points are not.

No transfer credit will be awarded until all final transcripts are received. It is the student's responsibility to see that this is done.

COLLEGE PROFICIENCY EXAMINATIONS

The New York State College Proficiency Examination Program (CPE) is a means by which students may receive college credit for specific courses by examinations, without being in residence for a course or taking structured correspondence lessons. College credit is generally awarded for a grade of "C" or better. The College also accepts credits from the College Level Examination Program (CLEP) of the College Entrance Examination Board.

EDUCATIONAL OPPORTUNITY PROGRAM

The basic goal of the Educational Opportunity Program at the College is to provide qualified students with a college education—the opportunity for personal growth and professional development. Upon completion of the program, graduates will be provided access to jobs in professional fields. The program is not designed for students who need only financial assistance. It serves students who ordinarily would not be able to attend college because of a lack of financial resources and insufficient academic preparation. To qualify, students must be New York State residents and demonstrate the potential to successfully complete the courses of study at the College.

Further information regarding the Educational Opportunity Program may be obtained by contacting the Office of Admissions.

INTERNATIONAL STUDENTS

The College accepts international students on the undergraduate level if they can satisfy all regular admission requirements. It is recommended, however, that students from foreign countries obtain their baccalaureate degree in their home country, and apply to the College as graduate students. Experience has shown that this arrangement provides for greater academic achievement and more efficient use of the student's time and funds. International students applying for admission must satisfy all of the course prerequisites for their intended major. In addition they must:

1. Demonstrate proficiency in the English language through acceptable performance on the Test of English as a Foreign Language (TOEFL) and/or the College Entrance Examination Board (CEEB) Achievement Text in English, and
2. Produce evidence of their ability to meet all their financial obligations.

Undergraduate international students must file official State University of New York foreign student admission forms. No fee is required for processing the application. Prior to international student acceptance, adequate financial resources must be demonstrated, and after acceptance health and accident insurance must be obtained before the student will be allowed to register at the College.

International students who are currently at an American college may apply for transfer to the College. They must meet all entrance requirements of international students plus those of a transfer student as listed above. Permission to transfer must be obtained from the U.S. Immigration and Naturalization Service district office having jurisdiction over the college in which the student is currently enrolled.

HEALTH EXAMINATION BOARD

Each new student is required to submit a medical history and physical examination report on a form that will be sent after the initial acceptance notice.

GRADUATE ADMISSION

Admission to graduate study may be granted only to applicants with at least a bachelor's degree from a recognized institution and whose preparation has been suitable in quality and content for the proposed field of major study. Applicants will be evaluated on the basis of the following: (1) their academic record should show at least a B or 80 percent average for the junior and senior years; (2) Graduate Record Examination aptitude scores, and, in some cases, subject matter (advanced) tests indicative of graduate study ability (see below); (3) supporting letters of recommendation; (4) a statement of specific educational and professional goals which describes the choice of degree program and the students' plan for the pursuit of the objectives in the program; and (5) other evidence of scholarly achievement and potential. Admission is selective with priority given to applicants who have high scholastic standing.

ADVANCED TESTS

Subject matter (advanced) test scores are required by the following programs:

Graduate Programs	*Advanced Test*
Chemistry	Chemistry
Environmental and Forest Biology	Biology

PROCEDURE

All applicants are required to submit Graduate Record Examination aptitude scores. This examination is offered several times each year in major cities of the world. For information on registration and scheduling write to the Educational Testing Service, Princeton, New Jersey 08540. Test scores should be sent to the Office of Academic Programs (Institutional number R2530).

The College provides a special application form for graduate work. Requests for information and applications should be addressed to the Office of Academic Programs.

INTERNATIONAL STUDENTS

Citizens of other countries with special educational objectives are accepted for graduate study in all programs. They must show satisfactory evidence that they have completed studies in their major field equivalent to those at a recognized American institution with a scholastic record equivalent to a B average in their junior and senior years. They must submit Graduate Record Examination scores as explained in the section on Admission Requirements. Also, applicants whose native language is other than English must submit scores on the Test of English as a Foreign Language (TOEFL). This requirement may be waived if the student has received a degree from an American institution. This examination is offered several times each year in major cities of the world.

For information on registration and scheduling, write to the Educational Testing Service, Princeton, New Jersey 08540, U.S.A. In submitting test scores, request that they be sent to the Office of Academic Programs.

EXPENSES

APPLICATION FEE

When a student applies for admission to an undergraduate program at any of the State University of New York units, a nonrefundable application fee is required. More information about the fee and guidelines for exemptions is provided in the "Application Guidebook" for the State University of New York. There is no application fee for those applying for graduate study.

ADVANCED PAYMENT FEE

All admitted undergraduate students pay a fee of $50, which is credited to the student's first semester tuition. This payment should be sent to the College Business Office accompanied by the form provided by the Office of Admissions. The payment is required prior to May 1, or 30 days after acceptance, whichever is later. It is refundable up to May 1, or within that 30-day period. There is no advanced payment fee required for those accepted for graduate study.

TUITION AND FEES (As of June 15, 1981)

The tuition and fee structure of the College of Environmental Science and Forestry covers usage of library, infirmary, physical education facilities, ROTC, special testing, and other services, as well as an assessment for student activities and charges for expendable supplies and equipment.

Tuition is charged in the following rate per semester:

Tuition Type	NYS Resident Students	Out-of-State Students
Undergraduate Matriculated		
Full-time	525.00	875.00
Part-Time	35.00/credit hour	58.50/credit hour
Graduate Matriculated		
Full-Time	850.00	1092.50
Part-Time	71.00/credit hour	91.50/credit hour
Students who do *not* hold a Baccalaureate Degree		
Course Nos. 100-599	35.00/credit hour	58.50/credit hour
Course Nos. 600-999	71.00/credit hour	91.50/credit hour
Continuing Education Non-Degree students who hold a Baccalaureate Degree		
Course Nos. 100-499	35.00/credit hour	58.50/credit hour
Course Nos. 500-999	71.00/credit hour	91.50/credit hour
Maximum Total Tuition for 12 credit hours or more	850.00	1092.50

STUDENT ACTIVITY FEES

In addition to tuition, the student body has voted to assess each full-time undergraduate student $24 per year to cover the cost of student activities. Full-time non-matriculated students are charged a fee of $12 per semester, and part-time matriculated students $1 per credit hour. Full-time graduate students likewise have a mandatory activity fee of $15. ESF students also pay an activity fee to Syracuse University to cover SU-sponsored activities and services available to ESF students, not duplicated by College organizations. These fees are $26.75 for full-time undergraduate and $13 for full-time graduate students. Part-time matriculated students are charged $14.50 per year payable at fall registration; part-time matriculated graduate students are charged $8 per year.

COLLEGE FEE

There is a State University of New York general college fee of $25 per year for all full-time students. Part-time student fee is $.85 per credit hour.

COMMENCEMENT FEE

A commencement fee of $12 is required at the beginning of the semester in which the degree is expected. Additional costs are incurred by graduate students for the binding, abstracting, and microfilming of theses.

TERMS OF PAYMENT

A check or money order for tuition and fees should be made payable to State University of New York College of Environmental Science and Forestry. This payment is required by the last day of the registration period and can be paid at the College's Business Office either prior to registration or during registration. A fee of $10 is charged for registering later than the established date.

HOUSING AND BOARD COSTS

ESF does not operate student residences or dining halls. These facilities are offered by Syracuse University. Specific information about available housing and board plans is available from the Office of Residence and Dining Services, Syracuse University, Syracuse, New York 13210.

In general, housing costs at SU range from $1,100 to $1,900 for an academic year, reflecting the diversity of available accommodations for graduate or undergraduate, single or married students. Most dormitory rooms accommodate two students and are furnished with beds, mattresses, desks, chairs, study lamps and dressers. A commercial linen service is available to those who order it. Separate dormitories are maintained for graduate students.

Furnished and unfurnished apartments are also available for both single and married students. These are located in a housing complex approximately two miles from the main campus, and are regularly serviced by a free shuttle-bus.

A variety of options on board offerings are available for all students, whether or not they reside in University dormitories. Costs range from $740 to $1,420 for an academic year.

In addition, a wide variety of living arrangements in private homes and apartment complexes is available in the Syracuse metropolitan area.

Payment for housing and board is made directly to Syracuse University.

OTHER COSTS

Students majoring in Resource Management attend a five-week Summer Session in Field Forestry at the Warrensburg Campus between the sophomore and junior years. Forest Biology majors have the option of attending this session or the Summer Session in Environmental Biology at the Cranberry Lake Biological Station at the end of the junior year. Cost for either five-week session is approximately $350 plus travel and personal expenses.

An extended field trip of up to three weeks at the end of the junior year costs approximately $250 for Wood Products Engineering students.

Field trips for Landscape Architecture students range between $125 and $150. In addition, students enrolled in the five -year Landscape Architecture program are required to spend one semester off campus. This is a self-described and student-budgeted program. Costs do not necessarily exceed those of a semester on campus, but additional costs are often incurred depending upon the location chosen.

The cost of books and supplies is approximately $200 to $400 a year. Additional costs for personal expenses, recreation, clothes and travel depend on the individual, and they may range from $500 to $700 a year.

REFUNDS

The following policies apply to tuition liability and refunds for students canceling their registration.

A student who is given permission to cancel registration is liable for payment of tuition in accordance with the following schedule:

Liability During Semester

lst week:	0%
2nd week:	30%
3rd week:	50%
4th week:	70%
5th week:	100%

Application for refund must be made within one year after the end of term for which the tuition was paid to State University. The first day of class session is considered the first day of the semester, and Saturday of the week in which this first session occurs is considered the end of the first week for refund purposes. It is interpreted that a student who does not attend any class sessions after Saturday of the first week and who notifies the College of his intent to cancel registration on or before the second Saturday following the first day of classes will be considered to have canceled his registration during the first week.

There is no tuition or fee liability established for a student who withdraws to enter military service prior to the end of an academic term for those courses in which the student does not receive academic credit.

A student who is dismissed for academic or disciplinary reasons prior to the end of an academic term is liable for all tuition and fees due for that term.

A student who cancels registration at a unit of the State University and within the same term registers at another unit of the State University is entitled to full credit for tuition and fees paid for that term.

Notwithstanding any other provisions for refund, when a student has withdrawn through circumstances beyond the student's control, under conditions in which the denial of refund would cause undue hardship, the Chief Administrative Officer of the unit may, at his discretion, determine that no liability for tuition has been incurred by the student, provided the student has not completed more than one half of the term and has not received or will not receive academic credit for the term. Such action, including the reason for withdrawal, must be in writing.

FINANCIAL ASSISTANCE

The College of Environmental Science and Forestry offers four basic forms of student financial assistance: scholarships or grants, part-time employment, long-term loans, and assistantships for graduate students. These programs are coordinated to supplement parental support, summer work, savings, and assistance from other sources. The sources of funds for financial assistance programs, the guidelines for determining the recipients, the procedures for applying, and the method of disbursement of funds vary from one program to another. This information is presented in detail in *Financial Assistance at ESF*, a separate publication which is mailed to all applicants, and is available to the public by contacting the Office of Financial Aid.

Financial aid advisors are aware of the many problems of financing higher education and meeting day-to-day living expenses for both undergraduate and graduate students, and are available to discuss individual student problems. All students are encouraged to apply for financial aid.

HOW TO APPLY

Each year students interested in receiving financial assistance, *except for graduate assistantships*, must complete the application process. (Graduate students who wish to be considered for a graduate assistantship refer to page 37, and follow those instructions.) Two forms are necessary to apply:

1. The candidate must complete a College Application for Financial Aid Transcript and return it to the Office of Financial Aid by MARCH 15. The application is included in the publication, *Financial Assistance at ESF*. Applications will be accepted after March 15; it should be noted, however, that available funds may already be committed to other students. Applicants need not wait for notification of acceptance to the College before applying for financial aid.
2. The candidate must also complete the Family Financial Statement (FFS) available in the College's Office of Financial Aid, high school guidance, and most college financial aid offices.
3. Students are invited to discuss with the professionals in the Financial Aid Office any problems in financing their education.

This application information is based on current requirements, and financial aid systems and forms are undergoing constant change. Applicants are urged to contact the Office of Financial Aid for the latest information and requirements.

SELECTION OF RECIPIENTS

In making award decisions, consideration is given primarily to comparative financial need; however, scholastic standing, character, and potential contribution to the College community are also factors in making certain awards.

SCHOLARSHIP AND GRANT PROGRAMS (SEOG)

Supplemental Educational Opportunity Grants

The College is the recipient of funds authorized under Title IV-A of the Higher Education Act of 1965, as amended. These funds enable the College to award grants to undergraduate students who have high financial need. Grants range from $200 to $2,000 per year and must be matched by other awards.

ESF Educational Opportunity Grant Program (EOP)

Students accepted into the College's Educational Opportunity Program may receive, in addition to other financial assistance, a special award to pay for education-related costs. Students must come from a socio-economically disadvantaged background to be eligible.

Prospective Educational Opportunity Program students must apply for financial aid when submitting their admissions applications.

Pell Grants (Formerly Basic Educational Opportunity Grants)

The BEOG Program was authorized in the Education Amendments of 1972. Grants are available to eligible full-time and half-time undergraduate students. The amount of the award can vary from $200 to $1,750.

Applications are available from high school guidance offices or any college office of financial aid. Students should submit the Student Eligibility Report (SER) to the Office of Financial Aid as soon as it is received from the processor.

Tuition Waivers for International Students

Tuition waivers may be granted each year to qualified students from foreign countries. Interested students should contact the Assistant Vice President for Academic Programs.

Regents Programs

Additional information and applications for the following programs are available from the College or:

New York Higher Education Services Corporation
Tower Building
Empire State Plaza
Albany, New York 12255

REGENTS COLLEGE SCHOLARSHIPS

High school students who are New York State residents may qualify for a $250 annual scholarship by taking a competitive exam during their senior year.

TUITION ASSISTANCE PROGRAM

These awards are available to New York State residents who are enrolled in full-time degree programs. Based on income, awards range from $200 to full tuition. Separate application is necessary.

REGENTS GRANTS OR CHILDREN OF DECEASED OR DISABLED VETERANS

These grants are awarded to children of parents who served during specific periods of war or national emergency and who died as a result of such service, or suffered a disability of at least 50 percent. The award entitles a New York State resident to $450 per year.

Vocational Rehabilitation Grants

Financial assistance and program counseling are provided by New York State for students with disabling handicaps. Information is available from any Office of Vocational Rehabilitation.

Veterans' Benefits

The Veterans' Readjustment Benefits Act of 1966 as amended enables veterans and children of deceased or disabled veterans to obtain financial aid for their college education.

Additional information and counseling are available from the Veterans' Affairs Counselor at the College. Local veterans' administration offices, or the State Regional Office, 111 West Huron Street, Buffalo, New York 14202, can provide information and application forms.

Social Security Benefits

The 1965 amendments to the Social Security Act extended the age limit for a child's benefits from 18 to 22, providing the child is a full-time student. Local Social Security offices have additional information.

Assistance for Native American Students

Native American students with financial need may be eligible for scholarship and grant assistance through programs sponsored by the federal Bureau of Indian Affairs and the New York State Education Department. For more information about the programs, students should contact the Bureau of Indian Affairs, 1951 Constitution Avenue NW, Washington, D.C., or the Native American Education Unit, State Education Department, Education Building Annex, Albany, New York 12234.

Private Fellowships, Scholarships, and Grants

The College administers a number of programs which have been established by private individuals, companies, organizations and foundations. These scholarships and grant programs have varying eligibility requirements and are awarded to students according to their respective guidelines which are described in more detail in *Financial Assistance at ESF*. The following is a list of the programs: Alumni Memorial Awards; Alumni Educational Grants; Nelson Courtlandt Brown Scholarship Fund; Henry H. Buckley Student Aid Award; New York State College of Forestry Foundation, Inc.; Mary E. Palmer Memorial Scholarship; Portia Farrell Morgan Scholarship; Phyllis Roskin Memorial Award; and Student Association grants.

Syracuse Pulp and Paper Foundation, Inc. Scholarships

Scholarships from this foundation are awarded to students in paper science and engineering. The scholarship amount is $100 more than the recipient's annual tuition charge. Incoming transfer students entering the program should request a Pulp and Paper Scholarship application from the Office of Financial Aid. It is necessary to reapply each year for the scholarship.

State University Supplemental Tuition Assistance

A limited number of small grant awards are determined annually by the College for students with financial need.

EMPLOYMENT OPPORTUNITIES

College Work-Study Program (CW-SP)

The College participates in the Federal College Work-Study Program, which provides part-time jobs during the academic year and full-time positions during the summer to students who need financial assistance to attend the College. Wages for these positions begin at minimum wage rate and increase as duties and responsibilities increase.

Job Locator Service

The College coordinates and maintains lists of part-time and summer employment opportunities. Interested students should contact the Student Employment Coordinator in the Office of Financial Aid for additional information.

A part-time employment program is available to qualified veterans. More information is available from the Veterans' counselor at the College.

LOANS

National Direct Student Loans

These loans are available to students with financial need who are enrolled at least half-time. An aggregate of $6,000 is the maximum an undergraduate can borrow, and $12,000 is the aggregate a graduate student can borrow. Repayment and 4 percent interest begin six months after leaving college. Deferment and cancellation benefits are available for certain situations.

Insured Student Loans

This program is administered by the New York Higher Education Services Corporation (NYHESC) for New York State residents. These loans are available from a bank or other lending agent to students who are registered at least half-time. Undergraduates can borrow an aggregate of $12,500 for their undergraduate studies, and a graduate student can borrow an aggregate of $25,000. Repayment and 9 percent interest begin six months after leaving college (an additional 1 percent interest is paid at the time the loan is received). Applications are available at local banks.

Emergency Loans

The College is able to provide registered students interest-free, short-term loans. These loans are available because of the interest and support of the following donors: Alumni Association Short-term Loan Fund; David B. Schorer Memorial Fund; and Edward Vail Emergency Fund.

Students should contact the Office of Financial Aid when need arises for a short-term loan.

GRADUATE ASSISTANTSHIPS

Assistantships are awarded to students of demonstrated scholarship and whose education and experience enable them to assist in laboratory instruction and research. The amounts of the assistantships range from $3,600 to $6,000 per year. In addition, tuition is waived. Students who hold an assistantship must be enrolled for full-time study.

Beginning graduate students may apply for assistantships on their application for admission, and continuing graduate students should consult with their major professors.

ACADEMIC POLICIES

The following academic policies are extracted from the complete undergraduate and graduate policies which are contained in the *Student Handbook*. The *Student Handbook* is available from the Office of Student Affairs, 105 Bray Hall.

UNDERGRADUATE AND GRADUATE POLICIES

Published Requirement

Students must satisfy the requirements for graduation in effect at the time of their first matriculation as a student. Students may graduate under the requirements stated subsequent to those in effect at their matriculation, but they may not use prior ones.

Attendance

Students are expected to adhere to the attendance policy stated by each course instructor. Instructors may make attendance part of the course requirement.

Audits

Students may informally audit ESF courses with the permission of the course instructor. No record will be maintained of the informal audit nor will any grade be assigned. No fee is required for informal audits.

Students may formally audit courses with the permission of their major professor and the course instructor. They may not be used to satisfy any graduation requirements. Formally audited courses will appear on the student's transcript and will be graded either "SAU" (satisfactory audit) or "UAU" (unsatisfactory audit). The grade will be assigned based on the criteria for audit established by the course instructor.

Withdrawal from ESF

Students who withdraw on or before the "drop date" for a semester will have their records marked "(date): Withdrawal." Courses will appear for that semester with the grade of "W".

Students who withdraw after the "drop date" for a semester, but before the semester ends, will have either "WP" (withdraw passing) or "WF" (withdraw failing) listed after each such course.

Students who withdraw from the College and in the future wish to return must apply for readmission.

Prior to withdrawal from ESF, students must schedule an interview in the Office of Student Affairs.

Statement of "Good Academic Standing"

The term "in good academic standing" means that a student is eligible or has been allowed to register for and undertake academic coursework at the College for the semester in question. In some instances the College may define a student as being "on academic probation." The mechanism of academic probation, including any accompanying constraints upon a student's activities, is intended merely as an educational device designed to encourage greater effort on the part of students who appear to be having difficulty in meeting certain academic standards. Placement on academic probation may precede denial of the right to register for academic course-work if certain conditions are not met, but a student on academic probation is considered to be in good academic standing. Any question concerning whether or not an individual student is in good academic standing will be determined by the College Academic Affairs Committee.

UNDERGRADUATE POLICIES

Credit Hour Load

To be classified as full-time, an undergraduate student must register for at least 12 credit hours during a semester. A student may not register for more than 18 credits during a semester unless permission from the student's advisor is obtained.

Evaluation

For each course completed, one of the following grades will be awarded:

Grade	*Definition*	*Grade Points*
A		4.0
A-	Excellent	3.7
B+		3.3
B	Good	3.0
B-		2.7
C+		2.3
C	Passing	2.0
C-		1.7
D	Minimum Passing	1.0
F	Failure	0
I/F	Unresolved Incomplete	0

Under conditions defined elsewhere, the following grades may be assigned, none of which yield grade points:

Grade	*Definition*
W	Withdraw
WP	Withdraw Passing
WF	Withdraw Failing
SAU	Audit (Satisfactory)
UAU	Audit (Unsatisfactory)
I	Incomplete

Grade Point Averages

Semester and cumulative averages are computed by dividing the total grade points earned by the total credit hours completed, i.e., all courses graded "A - F."

Academic Honors

DEAN'S LIST

Students who carried 12 or more credits of coursework graded "A - F" and earned a minimum grade point average of 3.00 will be placed on the Dean's List for that semester.

Graduation Honors

Students will be graduated with the appropriate honor if the following criteria have been met:

A minimum of 30 credits of ESF and Syracuse University courses have been completetd as a matriculated, upper-division student.

A grade point average of: 3.00 - 3.33, *cum laude*; 3.34 - 3.82, *magna cum laude*, 3.83 - 4.00, *summa cum laude.*

Academic Dismissal

Undergraduate students who earn less than a 2.00 cumulative grade point average shall have their records reviewed by the appropriate College-wide faculty committee which may delegate this authority. Based upon this review, students with less than this minimum cumulative grade point average will be placed on either academic probation or dismissed from ESF. The decision on probation or dismissal will be based upon an overview of the total academic record and the mathematical possibility for attaining a 2.00 cumulative average by the projected graduation date.

When extraordinary conditions contributed to the academic dismissal of students, such students may submit a written appeal to the dismissal decision to the Office of Academic Programs. These appeals will be reviewed by the appropriate faculty committee which will decide either to sustain the dismissal or place the students on probation. There is no appeal beyond this committee.

Students who have been dismissed for academic performance may not reapply until at least one semester has elapsed.

Students dismissed a second time for academic performance may not again be considered for readmission.

Graduation Requirements

Undergraduate students are responsible for meeting the following requirements for graduation:

A. Matriculated status as an undergraduate student.
B. All course requirements must be satisfied.
C. A minimum cumulative grade point average of 2.00 (4.00 = A) for all courses taken as a matriculated student at ESF.
D. At least 24 of the last 30 credits must be registered through ESF.
E. Consistent with the State Education Department requirements, a total of at least 120 credits from courses accepted as transfer credit by ESF and courses successfully completed while a matriculated student at ESF.

GRADUATE POLICIES

Master's Credit Hours

A minimum of 30 credit hours of graduate level work is required for the master's degree. This degree shall represent completion of at least one academic year of graduate-level study or an equivalent that can be shown to accomplish the same goals.

Doctoral Credit Hours

For the doctorate, credit hour requirements vary depending on the student's background and specific degree program. Early in a student's program the coursework requirement will be established which is intended to provide the student with the required level of competency to satisfactorily complete the doctoral candidacy examination. The doctorate shall represent completion of at least three full-time academic years of graduate study beyond the baccalaureate degree or an equivalent that can be shown to accomplish the same goals.

Doctoral Research Tool Requirement

There is no College-wide requirement for languages or other tools of research for doctoral students. However, the faculty of any program may establish such requirements.

Time Limit

Students must complete all requirements for the master's degree within three years of the first date of matriculation. For the doctoral degree, students must complete all requirements for their degree within three years of satisfactory completion of the doctoral candidacy examination or they will be required to retake the candidacy examination.

Credit Hour Load

A graduate student must be registered for at least one credit each semester, excluding summers, from the first date of matriculation until all degree requirements have been completed. Failure to register will indicate the student no longer wishes to pursue a graduate degree.

Although there is no full-time requirement for degree purposes, there is such a requirement for those who qualify for a tuition waiver and for some other forms of financial support. For these students the following definition applies:

With a master's degree, or the completion of 24 or more credits after the bachelor's degree, students holding an assistantship are considered full-time if they are registered for nine or more credits. All other students are considered full-time if they carry 12 or more credits. All graduate students in landscape architecture must carry 12 or more credits to be considered full-time.

Evaluation

For each course completed, one of the following grades will be awarded.

Grade	*Definition*	*Grade Points*
A		4.0
A-	Excellent	3.7
B+		3.3
B	Passing	3.0
B-		2.7
C+		2.3
C	Minimum Passing	2.0
C-		1.7
F	Failure	0
I/F, I/U	Unresolved Incomplete	0

Under conditions defined elsewhere, the following grades may be assigned, none of which yield grade points:

Grade	*Definition*
W	Withdraw
WP	Withdraw Passing
WF	Withdraw Failing
S	Satisfactory
U	Unsatisfactory
SAU	Audit (Satisfactory)
UAU	Audit (Unsatisfactory)
I	Incomplete

Grade Point Averages

Semester and cumulative averages are based on graduate level courses only and are computed by dividing the grade points earned by the credit hours completed, i.e., all courses graded "A - F".

Master's Study Integration

Students enrolled in a master's degree program are required to demonstrate the ability:

A. to critically evaluate, organize, analyze, and synthesize the coursework and other components of their program of study;
B. to relate these components to current concepts and issues in their chosen field and associated disciplines;
C. to work logically and independently; and
D. to communicate effectively.

Thesis requirements may be met by successful completion of one of the following three options. The faculty of any program may limit the number of permissible options for its students. As permitted by their program, students will choose and follow one option with the approval of their major professor and with the guidance of their steering committee. Each option must be designed to satisfy the above requirements.

OPTION 1. THESIS OR PROJECT AND DEFENSE

Scope. Under this option, in addition to completion of necessary coursework, students must prepare either:

1. a research-oriented thesis which investigates a problem that expands or clarifies knowledge in the field, with generalizable results, or
2. an application-oriented project which applies skills or techniques from the field to a specific problem.

Whichever is chosen, students are required to define an appropriate problem for investigation; review relevant information sources; develop a study design; collect, organize, analyze, and interpret data; and draw conclusions.

Product. The thesis or project must be documented in a thorough and appropriate format and style. It must be in a permanent form, which may consist of print or non-print materials.

Credits. Students must satisfactorily complete 6 to 12 credits for the investigation leading up to completion of the document. These credits will be graded on an "S/U" basis. Students must register for the approved number of credits for their investigation sometime during the three-year limit for the master's degree. They may register for more than the approved number of credits for their investigation, but the excess credits may not be used to fulfill the minimum 30 credits required for the master's degree.

Defense Examination. The thesis or project must be successfully defended.

OPTION 2. ACADEMIC OR PROFESSIONAL EXPERIENCE AND MASTER'S COMPREHENSIVE EXAMINATION

Scope. Under this option, in addition to completion of necessary coursework, students must engage in an academic or professional experience which applies, enriches, and/or complements the more formal coursework of their plan of study. This option might include, but not be limited to, an internship or an independent study experience. Whatever the form of the option, its objectives, organization, procedure, and manner of documentation must be submitted in writing and be approved by the student's major professor and steering committee before the experience is begun.

Product. This experience must be reported in a thorough and appropriate format and style. It need not be in a permanent form.

Credits. Students must satisfactorily complete 6 to 12 credits for this experience. These credits will be graded on an "S/U" basis. Students must register for the approved number of credits for their experience sometime during the three-year time limit for the master's degree. They may register for more than the approved number of credits for their experience, but the excess credits may not be used to fulfill the minimum 30 credits required for the master's degree.

Master's Comprehensive Examination. At the completion of their plan, students must successfully pass a comprehensive examination covering the major field, allied fields, and the content of their completed experience.

OPTION 3. COURSEWORK AND MASTER'S COMPREHENSIVE EXAMINATION

Scope. Under this option, students must satisfactorily complete a minimum of 42 hours of graduate level coursework appropriate to their field of study. As in other options, the design and sequencing of the coursework plan must be conducted with the guidance and approval of the student's major professor and steering committee.

Product. No product is required beyond that required for individual courses.

Credits. Students must satisfactorily complete a minimum of 42 credits of graduate level coursework. Students must complete these required credits sometime during the three-year time limit for the master's degree.

Master's Comprehensive Examination. At the completion of their plan, students must successfully pass a comprehensive examination covering the major field and allied fields.

Doctoral Thesis

Nature and Purpose

A thesis must be completed and successfully defended in order for the doctoral degree to be awarded. The doctoral thesis is the final and most important component of the series of academic experiences which culminate in the awarding of the Ph.D. degree. Three major functions are fulfilled by the thesis experience: (1) It is a work of original research or scholarship which makes a contribution to existing knowledge; (2) It is an educational experience which demonstrates the candidate's mastery of research methods and tools of the specialized field; and (3) It demonstrates the student's ability to address a major intellectual problem and arrive at a successful conclusion.

Examinations

Doctoral Preliminary Examination

An examination may be required of those admitted into a doctoral program to ascertain their level of understanding of the basic principles and techniques necessary to function effectively in that program. The results of the preliminary examination will be used to guide the major professor and the student in determining the appropriate coursework necessary to complete that requirement for the doctorate.

The format for the examination will be determined by the faculty in the program involved. It is recommended that the examination be primarily written with a supplemental oral presentation. When a preliminary examination is required it should be conducted as early as possible in a student's program, at least before the completion of the student's second semester.

Doctoral Candidacy Examination

A student admitted into a doctoral program must satisfactorily complete a candidacy examination covering the major field and, in a broader manner, allied fields in order to be advanced into the status of doctoral candidate.

The purposes of the doctoral candidacy examination are to determine the student's knowledge of factual material and ability to use this knowledge creatively and intelligently.

The doctoral candidacy examination must be taken when the majority of coursework is completed but before the student begins serious thesis investigation. The candidacy examination must be passed at least one year before the student may present a thesis for defense.

Defense Examination for Thesis or Project

All graduate students who are required to complete a thesis or project must successfully defend it and have it accepted by the College.

The purposes of the defense examination are to determine the validity and significance of the data; and evaluate the student's understanding of investigative methods, ability to critically analyze data, and ability to relate the study results to the appropriate field and to more general scientific principles and knowledge.

Academic Dismissal

Graduate students who earn less than a 3.00 cumulative grade point average or who earn two grades of "U" shall have their records reviewed by the College Academic Affairs Committee, which may delegate this authority. Based upon this review, students either will be placed on academic probation or will be dismissed from ESF. The decision on probation or dismissal will be based upon an overview of the total academic record, the mathematical possibility for attaining a 3.00 cumulative average by the projected graduation date, and the recommendation from the major professor, program coordinator, and school dean or program director.

When extraordinary conditions contributed to the academic dismissal of students, such students may submit a written appeal to the dismissal decision to the Office of Academic Programs. These appeals will be reviewed by the College Academic Affairs Committee, which will decide either to sustain the dismissal or place the students on probation. There is no appeal beyond this committee.

Students who have been dismissed for academic performance may not reapply until at least one semester has elapsed.

Students dismissed a second time for academic performance may not again be considered for readmission.

Graduation Requirements

Graduate students are responsible for meeting the following requirements for graduation:

A. The student must be in a matriculated status as a graduate student.

B. The approved academic plan for each student must be completed within the applicable time limit.

C. For the doctoral degree, the student must be admitted to candidacy and a thesis completed and successfully defended.

D. A minimum cumulative grade point average of 3.00 (4.00 = A) for all graduate level courses taken during the program of study at ESF must be achieved.

E. Consistent with the State Education Department requirements, a total of at least 30 graduate credits is required for the master's degree and, for the doctorate, at least three full-time academic years of graduate study beyond the baccalaureate degree or an equivalent that can be shown to accomplish the same goals.

STUDENT LIFE

HOUSING

The College of Environmental Science and Forestry does not operate its own residence facilities or food service. Students enter into a Room and Board Agreement with Syracuse University, which is adjacent to the State-operated College. Contracts for room and board made with Syracuse cover a full academic year (fall and spring semesters) and are not normally renegotiable during that time period.

Students have a choice of living centers at Syracuse University—large halls, apartment houses, cottages, fraternities and sorority houses, or cooperative units. Student resident advisors live on each floor or in each unit and are available for counseling, advisement, and referral services.

Syracuse University also has housing units available for married students and their families. While veterans are given preference, nonveterans can usually find housing.

Students who wish to live off campus may contact Alternative Action Services (ALTERACTS), a student-run housing organization at Syracuse University. An extensive listing of available housing in the Syracuse area is provided free of charge.

FOOD SERVICE

Syracuse University offers different meal plans to help meet the varying nutritional needs and interests of individual students. Students living in University apartments, co-ops, fraternities and sororities or off-campus can take advantage of the board plans available. Students living in dormitories and area housing without full kitchen services are required to subscribe to a board plan.

The College does not provide a food service program. However, a snack bar, located in the basement of Marshall Hall, is open 8 a.m. to 3:30 p.m. weekdays during the academic year.

EXTRACURRICULAR ACTIVITIES

Students at the College of Environmental Science and Forestry have many extracurricular activities to choose from, both on campus and in the community.

At the College

The *Undergraduate Student Association* (USA) and the *Graduate Student Association* (GSA) are the official representative bodies on campus governing student activities. Undergraduate and graduate students elect representatives from each school to manage the affairs of their respective organizations and the concerns of their constituents.

Campus organizations offer students an opportunity to broaden their knowledge and meet other students with similar personal and academic interests. These include: the *Basketball Club*; *Bob Marshall Club*, an organization of students concerned about the future of the Adirondack Mountains; the *Forestry Club*, the traditional sponsor of the intercollegiate Woodsmen's Team; *Botany Club*; *Mollet Club*, an organization of landscape architecture students; the *Recycling Club*; and the *Zoology Club*, which sponsors lectures, films, and field trips.

Other groups on campus include *Saengerbund*, the College singing group; and *Alpha Xi Sigma*, senior honorary society. There are also student chapters of the *Wildlife Society*, the *Society of American Foresters*, the *American Fisheries Society*, the *American Water Resources Association*, the *Forest Products Research Society, the American Society of Landscape Architecture*, the *Association of General Contractors*, *Society of Wood Science and Technology*, and the *Technical Association of Pulp and Paper Industries (TAPPI)*.

The two major student publications at ESF are the *Knothole*, a weekly newspaper, and *The Empire Forester*, an annual yearbook which has won many awards in past years.

Recent GSA-sponsored activities include a lecture series, a College-wide urban wildlife course, a traditional fall picnic, and various social functions designed to encourage interaction between graduate students and College faculty.

At Syracuse University

Students at the College of Environmental Science and Forestry have all the privileges of Syracuse University students: participation in student government, organizations, sports, and other extracurricular activities.

Men and women at the College participate in all Syracuse University intercollegiate sports, club sports, and intramurals. Archbold Gymnasium on the Syracuse University campus is the center of athletics and physical education. Additional indoor facilities are provided through Manley Field House and the new Carrier Dome which is the site of Syracuse University home football and basketball games. Facilities at Skytop recreation area include a lodge, and 22 tennis courts. The Women's Building offers instructional, social, and recreational facilities. All full-time undergraduate women are eligible to participate in intercollegiate competition in tennis, field hockey, volleyball, basketball, swimming, and diving.

Students are provided with many opportunities for acquiring musical training and performing experience through the Syracuse University Band, (Symphonic Band, Wind Ensemble, Stage Band, Concert Band and Jazz Workshops), the Syracuse University Orchestra, and the Syracuse University Chorus.

Membership is allowed in all Syracuse University student groups, including a wide variety of clubs, the International Student Association, religious and military organizations, and professional and honor societies.

In the Syracuse Area

The City of Syracuse and its surrounding countryside offer many cultural, educational, and recreational opportunities. The city has several fine museums, including the Everson with its outstanding collection of works by local, regional, and international artists; a local repertory theater; several points of historical interest; a professional symphony orchestra; and a Civic Center which attracts artists from around the world.

Eight parks lie within the city limits, numerous county and state parks, including Beaver Lake Nature Center and Montezuma Wildlife Reservation are within a short drive.

COLLEGE SERVICES

Career and Counseling Services

The Office of Career and Counseling Services is available throughout the student's college career as a place where they may seek, at any time, the advice of experienced counselors. This office should be the first contact when questions or personal problems arise. Most student problems can be dealt with in one or two brief contacts. The most severe problems requiring extensive assistance are referred to the cooperative facilities at Syracuse University and/or specialized agencies in Syracuse.

The Office is designed to provide additional assistance to students throughout the year to help them adjust to and successfully graduate from ESF. Through various presentations, counseling sessions, group activities and workshops, students are given the opportunity to further develop such skills as decision making, reading, studying, and test taking. Additional programs deal with coping with adjustments related to transferring colleges and exploring relationships between academic pursuits and career objectives.

Special efforts are made to assist students identified as having academic difficulties or adjustment problems. Often personal and academic problems are associated with career decisions. A key component of this office is to provide a variety of opportunities through resource materials, presentations, job development, and counseling to meet the individual needs of each student at his/her various stages of career readiness. Some career services offered through this Office are skills development workshops; lists of full-time, part-time, and summer jobs; on campus recruiting; advanced study information; career newsletters; reference information; a library out-reach program; and an alumni job list.

Each year this office conducts a Placement Survey to monitor the success and progress of our college graduates. The reports are shared with the college community and made available to the public upon request. The following is a brief summary for the classes of 1979, 1980.

Of the 606 graduates from the Class of 1980:
- 260 were employed in their major field of study
- 98 were employed out of their major field of study
- 116 were entered in an advanced study program
- 49 were still available for employment
- 80 were unavailable for employment or did not respond

Of the 517 graduates from the Class of 1979:
- 252 were employed in their major field of study
- 56 were employed out of their major field of study
- 119 were entered in an advanced study program
- 20 were still available for employment
- 70 were unavailable for employment or did not respond

Services for the Handicapped

The Office of Administration and Services, assisted by Student Affairs, provides specialized support services and adapts general resources to assist handicapped students to obtain maximum academic, social, and cultural benefits within the College community. Some of the specific services provided or made available include: pre-admissions guidance, orientation, mobility training, reader recruitment, preferential housing assignments, tutoring and other supportive services as required to meet individual living/learning needs. The College is also prepared to respond to handicapped students' needs for personal and career counseling and job placement assistance.

For further information, contact the ESF 504 Coordinator, Mr. David G. Anderson, Office of Administration and Services, Room 209 Bray Hall (315) 470-6622. The College maintains liaison relationships with rehabilitation agencies within the local community and the state, including the Office of Vocational Rehabilitation and the Commission for the Visually Handicapped. For specific information regarding their own eligibility, students should contact the respective agency directly.

Health and Medical Facilities

Students may consult a physician for medical care or health advice at the Syracuse University Student Health Service. Full-time students are entitled to unlimited visits to the out-patient clinic and also 10 days of confinement per college year with ordinary medical care in the infirmary. Infirmary usage over 10 days will be at prevailing infirmary rates. Some laboratory examinations, if necessary for treatment or diagnosis of common illness, are provided without cost. Most common legal drugs are provided at a minimal charge.

A student accident or sickness insurance plan, available at fall registration, not only supplements the usual infirmary privileges, but is also a health protection plan during the summer months when students are not under the care of the Health Service. Married students with dependents who are not covered by Health Service privileges are strongly urged to provide themselves and their families with special insurance made available to University students. *All international students are required to carry health and accident insurance.*

SU Speech and Hearing Clinics

The Gebbie Speech and Hearing Clinics provide remedial assistance to all regularly enrolled students who may be handicapped by hearing, speech and voice disorders. This service is free to students.

SU Psychological Services and Research Center

Students desiring an analysis of their aptitudes, abilities and interests may secure special testing programs at the Testing and Evaluation Service Center on the Syracuse University campus.

SU Reading and Language Arts Center

The Syracuse University School of Education, in cooperation with the College of arts and Sciences and the Psychological Services and Research Center, maintains a reading and language arts center for research in the learning skills and for training teachers and specialists in reading and language arts. Representatives from the fields of medicine, speech and psychology cooperate in making diagnoses and in planning remediation. Large numbers of University students use this facility to improve their reading skills.

SU ROTC Opportunities

Students attending the College are eligible to participate in the Army or Air Force ROTC Program at Syracuse University.

ROTC at Syracuse University consists of both 4- and 2-year programs. Students attending the College for two years can gain admission to either the Army or Air Force program through participation in summer training. Both six week and four week camps and on-campus programs are available to suit individual needs.

The ROTC programs offer academic instruction, alternate and supplementary career opportunities, leadership experience and financial aid.

ESF Alumni Association

The Alumni Office serves as the liaison between the College, the Alumni Association Board of Directors and more than 6,000 alumni. The Association supports educational programs through scholarships, publishes a quarterly newsletter and represents alumni concerns.

ESF Student Rules and Regulations

The complete listing of guidelines for all students attending ESF is found in a separate publication, the *Student Handbook*, which is distributed at registration. Also distributed at registration are copies of "Rules and Regulations of Conduct and Behavior" which pertain to all students. It is the student's responsibility to be familiar with these regulations and abide by them.

DEGREE PROGRAMS AND AREAS OF STUDY

The College awards degrees in the following programs:

School of Biology, Chemistry and Ecology

Chemistry; B.S., M.S., Ph.D., with areas of study in biochemistry, natural products chemistry, environmental chemistry, or natural and synthetic polymer chemistry.

Environmental and Forest Biology; B.S., M.S., Ph.D., with areas of study in ecology, entomology, environmental physiology, fish and wildlife biology and management, pathology and mycology, pest management, plant science, soil ecology, or zoology.

Interdepartmental area of study in chemical ecology; M.S., Ph.D.

School of Forestry

Resource Management—General Forestry; B.S.

Resource Management and Policy; M.S., Ph.D., with areas of study in forest management, recreation management, policy and administration, forestry economics, quantitative methods, or land use planning.

Silviculture and Forest Influences; M.S., Ph.D., with areas of study in silvics, silviculture, forest soil science, tree improvement, or forest influences.

Interprogram areas of study in urban forestry or international forestry; B.S., M.S., Ph.D.

School of Forest Technology

Forest Technology; A.A.S.

School of Environmental and Resource Engineering

Forest Engineering; B.S.

Paper Science and Engineering; B.S.

Wood Products Engineering; B.S., with options in building construction, or forest products in which emphasis may be chosen in marketing, production systems engineering, or wood science.

Environmental and Resource Engineering: M.S., Ph.D., with areas of study in forest engineering, paper science and engineering, or wood products engineering.

School of Landscape Architecture

Environmental Studies, B.S.

Landscape Architecture; B.L.A.

Landscape Architecture; M.L.A., with areas of study in social/behavioral studies, natural/physical applied sciences, or design process, methods and management.

College-Wide Program

Graduate Program in Environmental Science; M.S., Ph.D., with areas of study in environmental education/communication, environmental assessment and impact analysis, environmental land use planning, water resources, or environmental science.

THE SCHOOL OF BIOLOGY, CHEMISTRY AND ECOLOGY

STUART W. TANENBAUM, *Dean*

The School of Biology, Chemistry and Ecology offers two curricula which support environmental science and forestry through the Department of Environmental and Forest Biology and the Department of Chemistry.

ENVIRONMENTAL AND FOREST BIOLOGY

ROBERT L. BURGESS, *Chairman*

The Department of Environmental and Forest Biology provides students with a firm foundation in basic biology in association with the principles of forest ecosystems and environmental science. It encompasses a variety of interconnected disciplines which concern themselves with living systems. It treats not only the form, function, and evolution of organisms, but their life requirements, tolerances, and interactions that are central to the stewardship of renewable natural resources and the maintenance of an environment of acceptable quality.

Effective management and protection of forests and related natural resources is increasingly dependent upon the understanding of living systems relative to productivity and tolerance to environmental impacts caused by the activities of man. Therefore, basic knowledge of biology is prerequisite to desirable practices and sound regulations for optimizing both the development and use of natural resources while avoiding deleterious impacts.

The critical importance modern society places upon the utilization of natural resources and the quality of our environment adds new and increasingly diverse dimensions to the services a well-trained biologist can render. The department is committed to meet this dynamically changing array of opportunity through diverse courses enriched by an active program of research that focuses upon upper-level undergraduate and graduate study. Through the addition of selected electives to a required core, undergraduates may focus their program toward a special biological field (see p. 56) or toward future graduate study. Graduate students may develop a course of study under the guidance of a major professor and graduate committee within any of several study concentrations (see p. 59).

In general, these academic programs attempt not only to stimulate interest in the recognition and understanding of traditional organismal taxa such as plants, animals, and protists, but deal as well with understanding the dynamic changes in biological systems which can be best ascertained in the context of the broad fields of ecology, physiology, evolution, and genetics. This understanding is accomplished by an integration of coursework with a strong research program, much of which is concerned with natural resource management and improvement of the quality of man's environment.

Undergraduate Program

The curriculum for the Bachelor of Science degree is built around a core of required courses which provide the student with a general education, an orientation to forestry, and a basic background in the principles of the biological and the physical sciences. Its design develops breadth in biology as well as depth in a selected biological field. Thus, although individual course selections around the required core may vary, all students major in biology and each, with an assigned advisor, develops a special plan of study.

A dual-major program is available that meets the undergraduate requirements of both the School of Forestry and the School of Biology, Chemistry and Ecology. (For details see p. 117).

A total of 125 credit hours, 60 of them prior to matriculation, is required for the Bachelor of Science degree. In addition to the core courses specified below, at least 21 hours in biology must be completed and, of these, at least 15 are to be from courses given in the College of Environmental Science and Forestry. These courses should be compatible with the intended concentration of study and must be at the 300 level or above. Six of the 21 credit hours must involve subject matter in plant science (courses designated FBO) and six in animal science (courses designated FEN, FZO), both exclusive of the five-hour summer field requirement. The balance of the required hours are chosen in consultation with the advisor.

Lower Division Courses

The curriculum facilitates transfer of freshman and sophomore credits from other institutions. To assume training in residence at the junior level, entering students should have successfully completed a minimum of 60 credits which include:

Course Area	*Credit Hours*
*General Chemistry with Laboratory	8
Organic Chemistry with Laboratory	8
*General Physics with Laboratory	8
Mathematics proficiency, through Integral Calculus	3-8
English	6
**Social Sciences—Humanities	9-12
*General Botany and Zoology **OR** General Biology with Laboratory	8
Biology Electives	3-6
TOTAL MINIMUM LOWER DIVISION CREDITS	60

*To enter at the junior level, a student must have completed at least these courses prior to registration.

**A course in technical writing and/or speech is recommended as part of the Social Science—Humanities group.

Upper Division Courses

Junior Year

			Credit Hours
First Semester	FBO 315	Dendrology	3
	FBL 320	General Ecology	3
	FEN 350	Elements of Forest Entomology	3
	Electives		6
			15
Second Semester	APM 491	Introduction to Probability and Statistics	3
	ERM 345	Soils **OR** GOL 105 Earth Science	3
	FBL 330	Principles of General Physiology	3
	Electives		6
			15

SUMMER FIELD EXPERIENCE—Must be met as described on page 55 5

Senior Year

			Credit Hours
First Semester	Electives		15
Second Semester	FBL 470	Principles of Genetics	3
	FBL 471	Genetics Laboratory	1
	Electives		11
			15
		TOTAL MINIMUM UPPER DIVISION CREDITS	65

A total of 125 credit hours is required to complete the B.S. degree in environmental and forest biology.

SUMMER FIELD EXPERIENCE

The curriculum requires that between the junior and senior year each student completes a minimum of five semester credit hours or its equivalent during five weeks' residence in an approved academic program in field biology. This requirement can be met by the appropriate selection of courses in Environmental Biology at the Cranberry Lake Biological Station (CLBS) where six to eight courses are offered during each of two five-week sessions (see p. 57). Earning five credits at one session satisfies the requirement; any additional courses taken in the other session count as elective credits.

One of the following alternatives to the CLBS program may instead be selected to fulfill the summer field requirement:

Alternative 1

Students desiring an experience in the principles and practices of professional forestry should attend the five-week Summer Session in field Forestry at the Pack Forest, Warrensburg Campus. Field instruction at this Campus emphasizes subject matter in dendrology, forest ecology, surveying, mensuration, and cartography.

Alternative 2

Other Biological field stations may be attended to earn the minimum five semester hours credit or its equivalent during a five-week's term of junior-senior level coursework. Petitions requesting this alternative must have appended course descriptions and program contemplated and be submitted no later than one month prior to the end of the spring semester preceding the summer program. A current file of alternative stations and course descriptions is maintained by the Curriculum Director.

Alternative 3

FBL 420, Field Experience-internship, under professional supervision may be authorized when containing a major academic-learning component and when thoroughly planned and well documented. It must be related to and supportive of the indicated career goal. The student must receive advance agreement from a member within the Department of Environmental and Forest Biology faculty to guide, collaborate, evaluate a work plan for the summer, and later assign a grade and credits to the internship. The plan must be submitted at least one month prior to the end of the spring semester and must be approved by the Curriculum Director.

Electives

General requirements for graduate study and a wide range of federal, state, municipal, and private biology positions are met by the curriculum. Through skillful selection of electives, the student may prepare for special biological fields related to natural resources or the environment. Those

training for biological positions in federal and state service should review Civil Service publications and become familiar with specific course requirements early enough to make timely elective choices. Students planning to meet special requirements for Federal Civil Service positions in forestry may do so by electing 10 credits in forestry courses and attending the Summer Session in Field Forestry at the Warrensburg Campus. Students are urged to use some elective time to enhance their communications skills. Courses in technical writing, applied communications or a language (as approved by their faculty advisor) are useful.

Special Biological Fields

Plant Science. Students may prepare for a wide variety of opportunities in the botanically oriented professions. Essential to understanding plants are their biochemical and physiological processes; their interactions with the environment and with one another; with animals and other organisms; their genetic makeup, evolution and classification. Requirements may be satisfied for such professional areas as botany, plant ecology, tree genetics, plant physiology, horticulture, tree maintenance, or plant quarantine.

Forest Pathology and Mycology. Protection of vascular plants and wood products from invading organisms, such as fungi, is basic to forest productivity, effective wood product use, and the maintenance of environmental quality. Program strength is in the ecological, physiological, genetic, and environmental aspects of disease. Students may train for positions in forest pathology, mycology, pest management, plant quarantine, or diagnostic laboratories. Opportunities for employment exist with federal, state, and private agencies.

Entomology. Insects play significant roles, both beneficial and detrimental, in their interactions with man, his resources, and his environment. Several courses are available on insect life and functions that enable a student to fulfill requirements of Civil Service and a variety of other employers. Program strengths are in forest entomology, medical entomology, pest management, and environmental toxicology.

Fish and Wildlife Biology and Management. A basic and applied program in fish and wildlife biology, including management and behavior, is provided for the student whose objectives are to develop professional skills in the biology and management of these natural resources.

Zoology. A basic and broad program is provided for the student whose objectives are to go on for graduate study or to further training in such subjects as physiology, soil invertebrate ecology, animal behavior, or animal ecology. Some opportunities with federal and state agencies are available at the baccalaureate level.

Ecology. Students are offered the opportunity to develop ecological skills in a number of areas. However, one's career potential is enhanced when ecological study is combined with knowledge of a major taxonomic group such as higher plants, microbes, or animals, including vertebrates or invertebrate forms such as insects, or with another unifying science such as physiology, biochemistry, genetics, or environmental chemistry.

Pest Management. Modern control of insects and disease dictates practices appropriate to maintaining an acceptable environmental quality. Through proper selection of courses, a student is able to achieve training that will result in wise selections of methods for an integrated approach to pest management. Training is more than adequate to prepare students for state examinations required for pesticide applicator's certification.

Silvics. Manipulation of forest ecosystems for human benefit relies upon strong preparation in biology. Students may combine plant sciences, silviculture, pathology, entomology and other courses to lead either to graduate study in silviculture or to forestry positions in industry or in municipal, state, or federal government.

Program in Environmental Biology

Cranberry Lake Biological Station
Cranberry Lake Campus
Cranberry Lake, New York

Students in the Environmental and Forest Biology curriculum generally satisfy their summer requirement by attending either session of the Summer Program in Environmental Biology at the Cranberry Lake Biological Station. Courses at the Station are senior-level offerings designed to come after the junior year spent on the Syracuse Campus. Students elect three courses during the five-week period and earn five semester-hours credit; any extra credits earned by attending both sessions count toward elective hours in biology. Students from other institutions are welcome, provided space is available.

Cranberry Lake and its environs are ideally suited for an advanced biology summer program. The surrounding topography is rolling hill and lake country dotted with numerous small ponds, closed bogs, and stream drainages. The lake itself is the third largest body of water in the Adirondacks. Because 80 percent of the shoreline is in State ownership, the lake remains relatively unspoiled by recreational developments and is free of pollution problems. Much of the original forest cover in the region was harvested years ago; today a rich variety of community types occupy those sites as the vegetation reverts again to the natural forest condition. The remaining virgin forests also provide the student with many examples of

stable forests, each type reflecting the particular environmental conditions controlling forest development. A wealth of wildlife parallels the variety of cover types over the region. The area is centrally located, providing easy access to a wide range of additional ecosystems ranging from bog to alpine types.

Facilities include four classroom-laboratories; dining facilities capable of serving 120; faculty quarters and cabins; an administration building; 12 cabins housing 6-8 students each; a recreation hall; and several smaller, supporting buildings.

The 10-week program extends from mid-June into mid-August and is divided into two five-week sessions. Courses are taught in blocks of 2½-day units, permitting concentrated study without hourly interruptions. These courses are designed to emphasize and effectively utilize the unique nature of this Adirondack setting, and all involve field trips each day into the surrounding forest and aquatic ecosystems. The scheduling of these courses remains fairly constant from year to year. Refer to the Course Offerings chapter of this catalog for further descriptions.

SESSION I. FBO 417 Adirondack Flora, FBO 427 Bryoecology, FZO 424 Vertebrate Ecology, FZO 427 Field Ornithology, FEN 450 Forest and Aquatic Insects, FBL 421 Ecology of Freshwaters, FBO 460 Field Problems in Forest Pathology, FBL 400 Forest Techniques for Biologists, FBL 498 Independent Research.

SESSION II. FBO 428 Wetland Plant Ecology, FBO 465 Field Mycology, FZO 424 Vertebrate Ecology, FZO 475 Animal Behavior, FZO 423 Microcommunity Ecology, FEN 460 Insect Ecology and Behavior, FOR 441 Forest Influences, FBL 400 Forest Techniques for Biologists, FBL 498 Independent Research.

Room, board, and fee charges are approximately $60.00 per week. Students wishing more information about the Summer Program in Environmental Biology may obtain a copy of the *Station Handbook* from the Director, Cranberry Lake Biological Station, State University of New York College of Environmental Science and Forestry, Syracuse, New York 13210.

Graduate Program

The graduate program in Environmental and Forest Biology is organized in nine interdependent biological study concentrations that provide comprehensive coverage within specific interest areas. Each concentration is governed by indicated faculty who define the scope of subject matter, recommend acceptance of students and guide them in a course of study. Some of these concentrations follow taxonomic lines while others are broad unifying areas basic to all taxa; one includes faculty of both Chemistry and Environmental and Forest Biology Departments. Students choosing to emphasize a taxonomic category should explore the desirability of engaging to some extent in the broader interdisciplinary areas. Similarly, it is often considered opportune for students enrolled in the latter to develop a degree of specialization in at least one taxon as a means of assuring a useful mix of talents. Those students whose interests are not served by the designated areas of concentration should explore the feasibility of alternate routes of study, provided the needed expertise is available, and they may be guided by faculty listed in the concentration nearest the student's interest.

Most students seeking the M.S. degree include in their study plan a research thesis and its defense. There also is an option to earn the degree with 42 hours of coursework, the latter specified by the student's advising faculty according to concentration core requirements. All who seek the Ph.D. must include original research and dissertation or its equivalent in the form of referred publications.

The major center of activity is Illick Hall, with the laboratories, classrooms, controlled spaces, and equipment that one would expect in a modern, five and one-half-storied building in which 85,000 square feet of working space is available for graduate study and research. Laboratories, many of them temperature and temperature-humidity controlled, and one sound-controlled, are provided for diverse study: plant development, physiology,tissue culture, biochemistry and toxicology, ecology, animal behavior, and similar endeavors. An herbarium, mycological collections, insect and other arthropod collections, and the Roosevelt Wildlife Collection of vertebrates are maintained in archival condition as useful resources for the academic program. Eight rooftop glasshouse units, three of them air-conditioned and one incorporated into a five-room indoor-outdoor insectary, are important to the full array of interests in plant science and plant-animal interactions.

Also available to the Department's students and faculty is a variety of sophisticated instrumentation: convenient access to a computer center; radio-isotope counting equipment, including liquid scintillation spectrometer and Cobalt-60 source; diverse analytical equipment and measuring devices; gas-liquid chromatography; and, in collaboration with the Chemistry Department, a comprehensive analytical expertise. The Nelson C. Brown Center for Ultrastructure offers scanning and transmission electron microscopy capability.

Supportive to the program are the academic resources, including courses, of Syracuse University, SUNY's Upstate Medical Center and the several campus facilities described elsewhere in this catalog. Our students participate as well in courses and utilize faculty and facilities at Cornell University in cooperative exchanges.

Excellent field sites and facilities are available for research in all aspects of the program in nearby or moderately distant locations from the Syracuse campus. In addition to the College's several campuses and field stations that offer a broad diversity of forest types, sites, and conditions, there are New York State Department of Environmental Conservation lands, the Montezuma National Wildlife Refuge, the Adirondack Mountains, and the transition zones near Lake Ontario, Oneida Lake, and Cicero Swamp that collectively offer a variety of habitat diversity from highlands to aquatic-terrestrial zones. The ponds, streams, and lakes in Central New York and the St. Lawrence River are regularly used by graduate students in wetlands and aquatic ecology and fishery biology.

Further academic advantages stem from the urban setting of the Syracuse campus. The Greater Syracuse area provides a convenient laboratory for studies basic to urban forestry: the growth and protection of woody vegetation, greenspace maintenance, the utilization of waste beds for plant growth, the detoxification of pollutants, and the restoration of terrain stripped of vegetation. Disposal of industrial and human pollutants and wastes require deeper understanding of the role of plants, animals and microorganisms in the biodegradation of organic matter. The conversion of organic materials into useful fuel, into additives for plant growth, or into protein feeds for domestic animals, to name a few, are stimulating study-in-depth of many elements of basic biology while at the same time offering substantial assistance toward the solution of pressing human problems.

Of the nine available study concentrations, eight are contained within the department: *Ecology*, *Entomology*, *Environmental Physiology*, *Fish and Wildlife Biology and Management*, *Pathology and Mycology*, *Plant Science*, *Soil Ecology*, and *Zoology*. One concentration is shared with faculty of the Chemistry Department: *Chemical Ecology*.

Ecology

ALEXANDER (Vertebrates, Wetlands), ALLEN (Forest Insects), BEHREND (Wildlife), BROCKE (Wildlife, Bioenergetics), CHAMBERS (Wildlife), DINDAL (Invertebrates), GEIS (Plants, Wetlands), KETCHLEDGE (Dendrology, Bryology), KURCZEWSKI (Insect Behavior), MITCHELL (Invertebrates, Bioenergetics), MULLER-SCHWARZE (Vertebrates, Behavior), NAKAS (Microbiology), PORTER (Vertebrate Ecology), RAYNAL (Higher Plants, Taxonomy), RINGLER (Fishery Biology), SCHAEDLE (Plant Nutrition), SHIELDS (Vertebrate Behavior), SIMEONE (Forest and Wood-boring Insects), TIERSON (Wildlife), VAN DRUFF (Wildlife), WERNER (Limnology).

Adjunct Faculty

GANNON (Aquatic Ecology), MORRIS (Diptera).

Understanding relationships between living organisms and their abiotic and biotic environment is fundamental to environmental science which also encompasses man's role in ecological systems. Ecology is an integrative science which depends on an understanding of ecological theory, habitat characteristics, and the basic biological attributes of organisms. This concentration area encourages the incorporation of this knowledge into those areas of practical concern. Specific research may entail the study of: distribution and abundance of organisms; community structure including trophic relationships, diversity or succession; and ecosystem properties such as patterns of energy transfer and biogeochemical cycling.

Entomology

ABRAHAMSON (Forest Insects, Pest Management), ALLEN (Forest Insects, Population Ecology), BREZNER (Physiology), KURCZEWSKI (Morphology, Taxonomy, Behavior), LANIER (Forest Insects, Pheromones, Cytotaxonomy), MILLER (Pest Management), NAKATSUGAWA (Toxicology), NORTON (Spiders and Mites, Insect Larval Taxonomy), SIMEONE (Forest and Wood-inhabiting Insects).

Adjunct Faculty

HOWARD (Medical Entomology), JAMNBACK (Diptera Ecology and Control), MORRIS (Medical Entomology), NAPPI (Physiology, Pathology).

Graduate study opportunities are most often found in the basic aspects of insect life and the role of insects in relation to man and his environment. The wide range of effects stemming from insect activity, from the beneficial to the deleterious, allows for a variety of research subjects in which insects play a major role. Thesis topics may concern insects affecting forests, shade trees and wood products, those relating to the health and well-being of man and those playing key roles as biotic parasites and predators of pest

species. Current research areas include population dynamics of forest defoliators, pheromone communications among beetles and moths, speciation of insects as understood through behavioral and cytogenetic study, biological control of insects of forest and public health importance and basic biochemistry of insect detoxification mechanisms.

Environmental Physiology

BREZNER (Insect Physiology), CASTELLO (Plant Virology), GRIFFIN (Fungus Physiology), HARTENSTEIN (Invertebrate Physiology), MITCHELL (Environmental Energetics), NAKAS (Microbial Physiology), NAKATSUGAWA (Insect and Vertebrate Toxicology), SCHAEDLE (Plant Physiology), WALTON (Plant Physiology), WILCOX (Plant Physiology).

Graduate study may include courses according to chosen academic goals, and research may include functional and molecular areas. Of current interest are mechanisms of action of plant growth hormones; biochemical regulation of seed germination; plant and microbial enzymology and virology; toxic action and detoxification of insecticides by vertebrate and invertebrate animals; production and action of plant phytoalexins and antibiotics; plant defenses against phytophagous invertebrates; mycorrhizae, ion transport, mineral nutrition, cambial physiology, and photosynthesis.

Fish and Wildlife Biology and Management

ALEXANDER (Vertebrates, Herpetology), BEHREND (Vertebrates), BROCKE (Vertebrates), CHAMBERS (Vertebrates), PAYNE (Ornithology), PORTER (Vertebrate Ecology), RINGLER (Fisheries Biology), SHIELDS (Vertebrate Behavior), TIERSON (Vertebrates), VAN DRUFF (Vertebrates, Ornithology), WERNER (Limnology).

Adjunct Faculty

NOON (Wildlife Biology), SCHACHTE (Fisheries Biology), SUGATT (Aquatic Toxicology).

Study in this area provides students with advanced preparation at both the M.S. and Ph.D. levels in biological concepts of fish and wildlife populations, particularly as they relate to the proper management of these important resources. Widespread and increasing concern for management of these wild animal resources has been matched by strong student interest in educational programs which prepare them for careers in the fish and wildlife professions. Graduate education, such as is available through this study area, is rapidly becoming a universal prerequisite to employment as a professional fisheries or wildlife biologist.

Areas of research include wetland ecology and management of wetland species, population-habitat relationships, predator ecology, urban wildlife relationships, endangered species studies, feeding ecology of fishes, stream ecology of larval fishes and homing behavior of fishes.

Forest Pathology and Mycology

ABRAHAMSON (Forest Pathology, Entomology), CASTELLO (Forest Pathology), GRIFFIN (Fungus Physiology), MANION (Forest Pathology), NAKAS (Microbiology), VALENTINE (Genetics), WANG (Mycology), WILCOX (Mycorrhizae), ZABEL (Forest Pathology and Wood Deterioration).

The study area in Forest Pathology and Mycology seeks to train students interested in developing an expertise responsive to the increasing pressures on forest and shade tree systems for wood fiber, public services, and amenities. This requires new sophisticated levels of disease understanding, disease control, a broad knowledge of fungi, bacteria and viruses, their environmental impacts and their roles in biodeterioration. Areas of staff interest and expertise appropriate for graduate student research emphasis include: environmental, fungal and viral tree diseases; mycorrhizae; wood decay and biodegradation processes; monitoring and impact assessment of disease in forest and urban tree systems; chemical and biological control of tree diseases; epidemiology of tree diseases and the genetics of resistance to tree diseases and to pathogen variability; physiology of fungus growth and development; taxonomy and biology of decay and imperfect fungi; fungus ultrastructure.

Plant Science

CASTELLO (Virology), GEIS (Ecology), GRIFFIN (Mycology, Fungus Physiology), KETCHLEDGE (Ecology, Bryology), MANION (Pathology), NAKAS (Microbiology), RAYNAL (Ecology, Taxonomy), SCHAEDLE (Physiology), TEPPER (Anatomy, Morphogenesis), VALENTINE (Genetics), WALTON (Physiology), WANG (Mycology), WILCOX (Physiology, Mycorrhizae), ZABEL (Pathology, Wood Deterioration).

Adjunct Faculty

AMES (Physiology), FAUST (Taxonomy), KARNOSKY (Genetics), SETLIFF (Mycology).

Plants, as the principal energy source for ecological food chains, serve as the structural and functional foundation of natural and managed ecosystems. The plant science concentration provides opportunity for study in a broad range of specialties fundamental to the understanding of plants and their interaction with other organisms, emphasizing both forest and related plant systems. Current faculty and student research interests include: dynamics of plant communities as affected by man and the environment; mechanisms of plant succession; epidemiology of forest and urban tree diseases; decay, discoloration and biomodification of wood; taxonomy, physiology, growth and ultrastructure of fungi; heritability of wood properties and disease resistance of trees; biochemistry and physiology of plant growth regulators; photosynthesis; mineral nutrition; mycorrhizae; bryoecology; morphogenesis in shoot and root systems; and plant tissue culture.

Soil Ecology

DINDAL (Invertebrates), HARTENSTEIN (Invertebrates, Physiology), MITCHELL (Invertebrates, Energetics), NAKAS (Microbiology), NORTON (Invertebrates, Taxonomy), WANG (Mycology), WILCOX (Mycorrhizae), ZABEL (Wood Biodegradation).

Soil ecology includes the study of interrelationships of soil-inhabiting organisms (as individuals, populations and communities) with their biotic, chemical, and physical environments. This field can be considered to be a frontier of science because of the myriad of undescribed species of soil-dwelling arthropods, nematodes and annelids, and the wealth of incompletely understood symbiotic relationships that can be readily discovered by students in this concentration. Soil ecology deals with fundamental aspects of biodegradation and nutrient cycling and is therefore important for improvements in crop culture and enlightened waste disposal.

The soil ecology concentration is supported by courses in physical aspects of soils, plant and animal taxonomy and general ecology.

Zoology

ALEXANDER (Vertebrates, Wetlands), BROCKE (Vertebrates), CHAMBERS (Wildlife Ecology, Management), DINDAL (Invertebrates), HARTENSTEIN (Physiology, Invertebrates), MITCHELL (Invertebrates, Bioenergetics), MULLER-SCHWARZE (Vertebrate Behavior), NORTON (Arachnology), PORTER (Wildlife Biology), RINGLER (Fishery Biology), SHIELDS (Vertebrate Behavior), VAN DRUFF (Wildlife Ecology), WERNER (Limnology, Aquatic Ecology).

Adjunct Faculty

BENZO (Vertebrate Physiology), BROWN (Wildlife), DEGENNARO (Vertebrate Physiology).

Zoology provides opportunity for in-depth coursework and fundamental research in morphology, physiology, taxonomy, and behavior of invertebrate and vertebrate animals. As one of the basic areas in the Department of Environmental and Forest Biology, Zoology is supportive of other concentrations such as Ecology, Fish and Wildlife Biology and Management, and Soil Ecology. Graduate studies in Zoology include both basic and applied research on animals of our natural ecosystem, including their associated soils and waters.

CHEMISTRY

KENNETH J. SMITH, *Chairman*—(Physical and Polymer Chemistry), CABASSO (Polymer Chemistry), CALUWE (Organic Polymer Chemistry), CAMPBELL (Phytoenzymology), FLASHNER (Biochemistry), HASSETT (Environmental Chemistry), JOHNSON (Environmental Chemistry), LALONDE (Organic and Natural Products Chemistry), LEVIN (Physical and Polymer Chemistry), MEYER (Nuclear Chemistry), SARKO (Physical and Polymer Chemistry), SCHUERCH (Wood and Polymer Chemistry), SILVERSTEIN (Ecological Chemistry), SMID (Physical and Polymer Chemistry), TIMELL (Wood Chemistry).

The academic program in chemistry enables the student to develop not only an understanding of chemical phenomena, but also an appreciation for chemistry that can link it to the biological and applied sciences. Programs include courses in traditional areas of chemistry, with additional study in those fields pertaining to environmental science and forestry. This broad spectrum of academic offerings is possible through close cooperation with Syracuse University, where a wealth of accessory courses at both the undergraduate and graduate levels are available. Emphasis on the investigative function of chemical science is manifest in the wide array of ongoing research projects within the department.

The Department of Chemistry offers the following areas of concentration leading to the Bachelor of Science degree:

Biochemistry and Natural Products Chemistry

Environmental Chemistry

Natural and Synthetic Polymer Chemistry

Students in all options, by selecting proper electives, may be certified on graduation as having completed an American Chemical Society approved curriculum. All options are excellent grounding for professional work at the B.S. level or for advanced graduate study.

Undergraduate Program

Lower Division Courses

For students transferring into the College as juniors, recommended courses consist of 68 credits or an associate degree and include:

Course Area	*Credit Hours*
Biology with Laboratory	8
General Chemistry with Laboratory	8
Organic Chemistry with Laboratory	8
Physics with Laboratory	8
Economics	3
English	6
Language, Literature or Communication	6
Electives	12-15
*Mathematics	6-9
TOTAL MINIMUM LOWER DIVISION CREDITS	68

*Mathematics through integral calculus. An additional mathematics course beyond integral calculus is required for the B.S. degree.

Upper Division Courses

Junior Year			*Credit Hours*
First Semester	FCH 325	Organic Chemistry III	4
	[3]CHE 332	Quantitative Analysis	2
	CHE 333	Quantitative Analysis Lab	1
	FCH 360	Physical Chemistry	3
	[1]Professional Elective		2-4
	Elective		3
			15-17
Second Semester	[2]Math or Elective		3
	FCH 380	Instrumental Methods	3
	FCH 361	Physical Chemistry	3
	CHE 357	Physical Chemistry Lab	2
	FCH 384	Spectrometric Identification of Organic Compounds	1
	[1]Professional Elective		2-3
	Elective		3
			17-18

[1]A sequence of professional electives should be chosen in the junior year. In addition to the freshman biology courses, a student whose emphasis is in biochemistry must take 3 semester hours of genetics and at least one other 3-semester-hour biology course. A student whose emphasis is in natural products must take 3 semester hours of biology in addition to the freshman biology courses and an additional hour of organic chemistry laboratory (FCH 496) and a second hour of FCH 384.

[2]One course of mathematics or applied mathematics beyond MAT 397, or equivalent, is required.

[3]CHE designations refer to courses offered at Syracuse University.

Biochemistry and Natural Products Chemistry Option

This option is designed for students who wish to approach problems in the life sciences with the tools and point of view of the chemist. In addition to a major concentration in the several branches of chemistry, the student obtains a solid grounding in the fundamentals of physics, mathematics, and biology. Professional electives can provide a minor concentration in botany, ecology, entomology, zoology, or physiology. Collaborative efforts of chemists and biologists are providing new solutions to problems of environment, natural resources, and health.

Senior Year			*Credit Hours*
First Semester	LIB 300	Library Research	1
	FCH 495	Introduction to Professional Chemistry	1
	FCH 571	Wood Chemistry I	2
	FCH 574	Wood Chemistry Lab	1
	FCH 530	Biochemistry I	3
	FCH 531	Biochemistry Lab	2
	[1]Elective		3
	Elective		3
			16
Second Semester	[2]FCH 498	Introduction to Research	5
	FCH 497	Undergraduate Seminar	1
	FCH 532	Biochemistry II	3
	FCH 573	Wood Chemistry III	2
	Elective		3
	Elective		3
			17
		TOTAL MINIMUM UPPER DIVISION CREDITS	65

[1]Introduction to Polymer Science, FCH 450 (3 credit hours) is suggested.
[2]Petition by student to Department for replacement of this requirement will be considered to allow time for special interest.

A total of 133 credit hours is required to complete the B.S. degree in chemistry with the biochemistry and natural products option.

Environmental Chemistry Option

The environmental chemistry option is designed for those students who wish to obtain a solid fundamental background in chemistry which will enable them to make a strong contribution towards the identification and solution of problems in the areas of pollution, air and water quality, analysis and basic research in environmental chemistry. A large number of professional electives, available through course offerings of other departments such as biology and engineering, provide the important interface with other disciplines necessary for a working understanding of the complex problems inherent in environmental studies.

Senior Year — *Credit Hours*

First Semester	LIB 300	Library Research	1
	FCH 495	Introduction to Professional Chemistry	1
	FCH 510	Environmental Chemistry I	3
	FCH 515	Methods of Environmental Chemical Analysis	3
	Chemistry Elective		3
	[1]Elective		3
	Elective		3
			17
Second Semester	[2]FCH 498	Introduction to Research	5
	FCH 511	Environmental Chemistry II	3
	FCH 497	Undergraduate Seminar	1
	FCH 519	Environmental Chemistry Seminar	1
	Electives		6
			16
		TOTAL MINIMUM UPPER DIVISION CREDITS	65

[1]Biochemistry I, FCH 530, (3 credit hours) is suggested.
[2]Petition by student to Department for replacement of this requirement will be considered to allow time for special interest.

A total of 133 credit hours is required to complete the B.S. degree in chemistry with the environmental chemistry option.

Natural and Synthetic Polymer Chemistry Option

This option is designed for students interested in the structure and physical properties of man-made and natural materials, the giant molecules of wood, plastics, polysaccharides, proteins, rubbers, and fibers. The recently discovered chemistry of these materials constitutes one-half the concern of the chemical industry and is the origin of a major revolution in our way of life and our understanding of nature. This special subject area is an advanced core of studies beyond the basic courses of the classical undergraduate chemistry curriculum.

Senior Year — *Credit Hours*

First Semester	LIB 300	Library Research	1
	FCH 495	Introduction to Professional Chemistry	1
	FCH 550	Introduction to Polymer Science I	3
	FCH 551	Polymer Techniques	2
	FCH 571	Wood Chemistry I	2
	FCH 574	Wood Chemistry Lab	1
	[1]Elective		3
	Elective		3
			16

			Credit Hours
Second Semester	[2]FCH 498	Introduction to Research	5
	FCH 552	Introduction to Polymer Science II	3
	FCH 497	Undergraduate Seminar	1
	FCH 573	Wood Chemistry III	2
	Electives		6
			17
		TOTAL MINIMUM UPPER DIVISION CREDITS	65

[1]Biochemistry I, FCH 530 (3 credit hours) is suggested.
[2]Petition by the student to Department for replacement of this requirement will be considered to allow time for special interest.

A total of 133 credit hours is required to complete the B.S. degree in chemistry with the natural and synthetic polymer option.

Graduate Program

Recent years have seen profound advances in the fundamental knowledge of chemical areas which have special significance for forestry and the environment. The following research areas have received active attention by both faculty and graduate students in the programs: polymer chemistry and physics; wood chemistry; environmental chemistry; biochemistry; chemistry of natural products, including ecological chemistry; and materials sciences.

Requirements for a master of science or doctor of philosophy degree in chemistry include a research project and thesis, along with an appropriate program of courses at the College and at Syracuse University.

Specific projects may vary from year to year, since they reflect the current interests of the faculty. Current research projects with *physiochemical* emphasis are: the chemistry, physics, solid-state and solution properties of natural and synthetic polymers, including studies in thermodynamics, statistical mechanics, crystallization, morphology, elasticity, conformation of macromolecules, optical properties, polymer catalysis, mechanism of polymerizations, polyelectrolytes, ion binding to macromolecules and ion pairing; chemistry of free radicals, radical ions and charge transfer processes; structure and properties of ionic solutions in nonaqueous media; crystal structure and morphology of cell wall constituents; heavy metal speciation. Current *organic* chemistry programs deal with synthesis of special polymers such as high temperature aromatic block, stereoregular vinyl polymers, and polysaccharides, various aspects of natural products chemistry, but especially alkaloids and terpenes, isolation and characterization of insect and mammalian attractants. An active program on the structure and topochemistry of the *polymeric* wood components, hemicelluloses, lignins and celluloses is underway. In *biochemistry*, department members are studying mechanisms of action of plant growth hormones, biochemical regulation of seed germination, plant enzymology and ultrastructural plant cytology.

Graduate research laboratories in the Hugh P. Baker Laboratory are well equipped for polymer studies, chemical, and biochemical research. Instrumentation includes analytical and preparative ultracentrifuges, Warburg respirometer, recording infrared and ultraviolet spectrophotometers, mass spectrometer, differential refractometer, electron spin resonance spectrometer, nuclear magnetic resonance spectrometers, automatic membrane osmometers, solid-and solution-state light scattering photometers, recording polarimeter and optical dispersion spectrometer, analytical and preparative high performance liquid chromatographs, combined gas chromatographs—mass spectrometry center, spectrofluorimeter, several ultramicrotomes, electron microscopes, X-ray diffraction, instrumentation chromatography and cold laboratories, and radiochemical laboratories with counters for solids, liquids and gases.

INTERDEPARTMENTAL AREA OF STUDY

The following concentration in chemical ecology is offered in collaboration with faculties of the Department of Environmental and Forest Biology and the Department of Chemistry. Interested students should apply to the department of major interest, which will have prime responsibility for setting requirements. Faculty from both departments can aid in the development of a plan of study enabling a student to acquire sophisticated skills in either chemistry or biology and an ample understanding of the other to grapple with problems requiring an understanding of both.

Chemical Ecology

LANIER (Insect Pheromones), MULLER-SCHWARZE (Vertebrate Pheromones), SILVERSTEIN (Pheromone Chemistry), SIMEONE (Insect Pheromones), TANENBAUM (Microbial Chemistry).

As a relatively new interdisciplinary endeavor, workers in this field attempt to understand organismal interactions, both intra- and interspecific, mediated by chemical substances such as hormones, pheromones, kairomones and phytoalexins. These occur at all taxonomic levels: between uni- and multi-cellular organisms, microbes and plants, plants and plants, plants and animals, microbes and animals, animals and animals. Study of such interactions has been accelerated in recent years through joint efforts of biologists and chemists in meaningful research accompanied by a growing body of literature.

THE SCHOOL OF ENVIRONMENTAL AND RESOURCE ENGINEERING

WILLIAM P. TULLY, *Dean*

The School of Environmental and Resource Engineering offers three undergraduate curricula and one graduate program which support the engineering aspects of environmental science and forestry through the Department of Forest Engineering, the Department of Paper Science and Engineering and the Department of Wood Products Engineering. A Bachelor of Science degree is awarded in each of these fields while advanced degrees (M.S. and Ph.D.) are offered through the graduate program in Environmental and Resource Engineering.

The undergraduate curricula provide students with a broad base of study and specialized education in engineering, science, and technology. Students learn to apply their education to improve the economic use of forest and rural resources, to enhance environmental quality and to increase the efficiency of processes and the wise use of water and timber, wood, paper, and related fibrous material products. Graduates are prepared for a variety of careers in industry and government service in these fields.

The specific requirements for entering each curriculum at the junior level and for completing the coursework residency requirements for the B.S. degree are described with the individual departmental programs which follow. The principles and professional skills of engineering analysis and design are developed in the courses appropriate for each curriculum as well as through informal contacts which are facilitated by the advantageous student/faculty ratio.

Qualified applicants with associate degrees in engineering science or an appropriate blend of science and mathematics usually gain full admission at the junior level. Graduates of two-year technology programs also may qualify for junior standing in certain curricula if their previous studies included the courses appropriate to departmental requirements.

Graduate Program

The Graduate Program in Environmental and Resource Engineering is based on a synthesis of the professional activites of the three curricular areas described above. Both the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees are offered. The program provides students with a balanced understanding of scientific research, engineering measurement, and engineering analysis and design, and with specialized depth and appropriate interdisciplinary breadth of knowledge in environmental and resource engineering. Its graduates are prepared for professional careers in specialized aspects of environmental and resource engineering and to become leaders in the private and public sectors of research, engineering, technology, teaching and administration relevant to the needs of society and, in particular, the industries and professions served by this program.

In its broadest sense this program is concerned with the application of science and engineering to the development and improved utilization of the natural environment and its forest-related resources. Thus, graduate education is understood to involve a wide range of scientific and engineering abilities and attitudes.

Specialized areas of study have been delineated to serve student interests. Within these areas of study, an individually-designed study program is developed for and with each student. A partial listing of specialized areas of graduate study and research include: wood science and technology, composite materials and wood treatments, design of timber structures, tropical timbers, anatomy and ultrastructure, pulp and paper technology, fiber and paper mechanics, chemistry of pulping and bleaching, colloid chemistry and fiber flocculation, chemical process engineering, pollution abatement engineering, forest engineering, water resources engineering, transportation and soils, energy and environmental quality, and remote sensing and photogrammetry.

Other related specialized areas of study may be identified when appropriate to both faculty and resource capabilities of the program and particular student needs. The specialization noted for each faculty member within the description for each department gives further indications of the possibilities offered.

Applicants to the graduate program in Environmental and Resource Engineering must meet general College-wide requirements, have prior education or experience suitable for beginning advanced study in their chosen area of specialization and have a deep commitment to the advancement of the academic and professional aspects of their career goals. Some coursework deficiencies may be corrected within individual study programs.

Candidates for the Master of Science degree must complete a program of study totaling at least 30 hours of credit earned through graduate level coursework. Six to 12 of these credits shall be given for a master's thesis or project. Up to six credit hours of graduate level coursework may be transferred from another institution.

The Ph.D. program usually builds upon a master's degree and demands further advanced mastery of material in the area of study and the dissertation topic. This includes additional graduate level coursework beyond the M.S. degree as determined with the student's committee.

Candidates for the Ph.D. must demonstrate competence in at least two of the following tools of research (statistics, computer programming or foreign language), pass a doctoral candidacy examination, and write and defend a dissertation.

Students are able to draw on the combined resources of the three academic departments in the School. In addition, courses and facilities of other schools of the College as well as Syracuse University complement those of the School of Environmental and Resource Engineering.

Prospective students who desire more information than is presented for each of the departmental descriptions and specialties described should contact the Dean, School of Environmental and Resource Engineering.

FOREST ENGINEERING

ROBERT H. BROCK, *Chairman* (Photogrammetric and Geodetic Engineering, Mapping Systems)

DUGGIN (Agricultural Assessment, Remote Sensing, Physics), HOPKINS (Surveying, Site Assessment, Remote Sensing), LEE (Computers and Systems Engineering, Transportation and Equipment, Soil Mechanics), McCLIMANS (Soils, Hydrology, Site Engineering), PALMER (Engineering Economics, Energy, Production and Harvesting Systems), TULLY (Structures, Engineering Hydrology, Water Resources).

A large portion of our nation's resources exist on forested and rural lands. These include: the increasingly valued renewable resources of timber, biomass and wildlife; the sustaining resources of water, soil and nutrients; and the derivative resources of paper, wood, and fibrous products and recreation and amenity values. Forest engineering is a unique field of engineering which is concerned with the design of systems and facilities to improve the sustained high quality yield of resources and multiple use benefits of goods and services from forested and rural lands.

The undergraduate curriculum in Forest Engineering provides a broad base of study and specialized education in engineering with an emphasis on site development for improved resource use and conservation. Instruction focuses on: locating and quantifying resources; designing harvesting, conveyance and transportation systems and networks for water and timber; designing structures, facilities and pollution abatement systems; and engineering planning for the development of sites and regions for multiple use.

Programs of advanced studies toward an M.S. or Ph.D. degree in environmental and resource engineering are offered. Individually designed programs provide graduates with sufficient understanding of the methodologies of scientific research and of the principles of engineering analysis or design to work with competence in resource related research, engineering design and management. There are opportunities for individuals who seek advanced education in such areas as water resources engineering, photogrammetry and remote sensing, transportation and soils, energy and environmental quality as well as forest engineering.

Because of the special importance of continual measurement and evaluation of the broad scaled parameters which affect the resource base, unique opportunities for study are available for students aiming toward professional careers involving the conceptualization, design, and maintenance of geographically referenced resource information systems. This includes elements of surveying, photogrammetry, remote sensing, and resource information systems design.

Undergraduate Program

The primary objective of this curriculum is to prepare qualified engineering graduates to operate with professional competence within the context of forest and natural resources development. The curriculum includes basic, forest, and engineering sciences. It utilizes elements of traditional engineering disciplines and develops its unique aspects from interweaving engineering design with an understanding of the natural environment and its renewable resource base including water, soil, timber, wildlife, and amenity values. Studies in the humanities and social and economic sciences are integrated throughout the curriculum to help achieve a broad and balanced perspective of professional practice in forest engineering.

Qualified graduates in search of advanced degree education enjoy ready acceptance to engineering graduate schools throughout the country. Graduates of the Forest Engineering curriculum may enter an established five-year program in either civil, industrial, or mechanical engineering at Syracuse University. A bachelor of science degree in engineering will be awarded by Syracuse University upon completion of the requirements of the fifth year.

To enter the Forest Engineering curriculum at the junior level, a transferring student must have acceptable college credit in the following coursework areas or be able to have suitable coursework substitutions for courses listed in the junior and senior years.

Lower Division Courses

Course Area	*Credit Hours*
Biology (Botany preferred) with Laboratory	4
General Chemistry with Laboratory	8
Physics with Laboratory	8
Calculus through Differential Equations	15
English	6
Economics (Macro- and Microeconomics)	6
Engineering Drawing (Graphics)	1
Computer Programming (FORTRAN or APL)	3
Engineering Mechanics (Statics)	3
*Engineering Science Electives (Dynamics or Electrical Science)	3
Humanities or Social Science Electives	3
TOTAL MINIMUM LOWER DIVISION CREDITS	60

Students must meet these minimum requirements, and they are encouraged to exceed the minima in the elective areas, to facilitate scheduling during the upper division years.

Upper Division Courses

Junior Year			*Credit Hours*
First Semester	FEG 300	Introduction to Forest Engineering and Design	2
	ERE 371	Surveying for Engineers	3
	FOR 321	General Silviculture	3
	CIE 327	Principles of Fluid Mechanics	4
	*Elective in Engineering Science (Electrical Science I recommended)		3
	**Elective in Dendrology or Wood Structure and Properties		2-3
			17-18
Second Semester	FEG 340	Engineering Hydrology and Flow Controls	4
	FEG 350	Introduction to Remote Sensing	2
	FEG 363	Photogrammetry I	3
	ERE 362	Mechanics of Materials	3
	IOR 326	Statistics for Engineers	3
	Elective		3
			18

Senior Year			*Credit Hours*
First Semester	FEG 410	Structures I	4
	FEG 422	Production Systems Engineering	4
	FOR 477	Resource Policy and Management	3
	CIE 437	Soil Mechanics and Foundations I	4
	**Elective	Engineering or Technical Forestry	2-3
			17-18
Second Semester	FEG 437	Transportation Systems	4
	ERE 440	Water Pollution Engineering	3
	ERE 488	Engineering Economics	1
	FEG 489	Forest Engineering Planning	3
	***Elective in Engineering Design Sequence		3
	Elective		3
			17
		TOTAL MINIMUM UPPER DIVISION CREDITS	69

ELECTIVE DISTRIBUTION

Humanities or Social Sciences: At least 9 credit hours must be elected in social sciences or humanities, at least 6 of which are recommended to be upper division.

**Engineering Sciences*: At least 6 credit hours to be chosen from:

Dynamics (mandatory unless at least 2 credit hours of coverage is included in lower division mechanics coursework)	(3)
Electrical Science I	(3)
Thermodynamics	(3)
Engineering Materials	(3)

***Technical Electives*: At least 5 credit hours to be chosen from:

Dendrology	(2)
Wood Structure and Properties	(1)
Summer Program in Field Forestry	(6)
Free engineering or technical forestry elective	(3)

****Engineering Design*: At least 3 credit hours in upper division engineering design or synthesis coursework as part of an advisor approved sequence which complements other forest engineering coursework, such as:

Photogrammetry II
Survey Systems Design
Structures II
Soil Mechanics II
Hydrologic and Quality Controls
Air Pollution Engineering
Production Systems II
Synthesis of Mechanical Systems

A total of 129 credit hours is required to complete the B.S. degree in forest engineering.

Graduate Program

Graduate studies and research are primarily concerned with environmental and resource related programs. Individual study programs leading to the master of science and doctor of philosophy degrees are available to meet the student's needs and interests in graduate study. Successful programs of graduate study may be efficiently designed by students with bachelor of science degrees in engineering or in forestry, natural sciences, physics, or mathematics.

Study programs with emphasis on environmental and resource engineering measurements may be designed in remote sensing, photo interpretation, geodetic engineering, analytical photogrammetry and photogrammetric systems. Programs emphasizing engineering analysis and design are available in water resources, energy, transportation, harvesting and site engineering systems. Included are the monitoring, measurement and evaluation of physical parameters affecting water, soil, timber, vegetation, and wildlife.

Support for graduate study and research in these areas is both internal and external. The internal support includes modern laboratory and instrumentation facilities in the Engineering Schools at both ESF and at Syracuse University. Exceptional departmental support exists for programs in environmental engineering measurements in the form of remote sensing and photogrammetric laboratories and the extensive forest properties owned by the College at which research may be conducted.

External support comes from several active sources, including industrial, commercial and governmental. Over the past two decades, close cooperation has developed special study and research opportunities with these sources.

PAPER SCIENCE AND ENGINEERING

BENGT LEOPOLD, *Chairman* (Organic Chemistry and Mechanical Properties of Fibers and Paper)

BAMBACHT (Pulping, Papermaking, Paper Machine Operation), BRITT (Chemistry of Paper Formation), DENCE (Organic Chemistry, Pulping, Bleaching), GORBATSEVICH (Pulping, Bleaching, Paper Technology and Paper Properties), JELINEK (Computer Applications, Process Engineering, Thermodynamics), LUNER (Surface and Colloid Chemistry of Papermaking Systems), MARK (Mechanical Properties of Fibers and Paper), MARTON (Mechanical and High-Yield Pulping), ROTHENBERG (Pulping, Bleaching), STENUF (Chemical Engineering, Instrumentation, Thermodynamics, Flow Phenomena, Process Control, Corrosion), THORPE (Fiber Physics, Paper Physics and Mechanics), TURAI (Water and Air Pollution Abatement Engineering, Materials Science and Engineering).

Outstanding for its vigorous growth and diversity of products, the pulp and paper industry is the fifth largest in the nation and exceptionally strong worldwide. Its need for professional men and women with training in science, engineering and technology is increasing even more rapidly than the industry itself. The College pioneered instruction in this area in 1920 with the organization of the paper science and engineering department, which has maintained a singularly high position in professional education for the continuing development of the pulp, paper and allied industries. Its graduates, who are in constant demand, occupy positions of leadership throughout the world.

The curriculum in Paper Science and Engineering is designed to provide a broad base of study and to prepare students for a variety of careers in the paper and related industries. Excellent opportunities are provided for men and women qualified to fill positions as research chemists, process engineers, technical service representatives, line management personnel, and many others.

The program provides education in the physical sciences and chemical engineering, with specific emphasis on those aspects of these disciplines which relate to the manufacture of pulp and paper. This includes the chemistry and anatomy of wood, the conversion of wood to pulp and paper, and the chemistry and physics of paper and paper formation. Instruction in chemical engineering includes a foundation of unit operations basic to the pulp and paper industry, as well as specialized courses, such as water and air pollution engineering.

The department is located in Walters Hall, opened in 1969. This facility is devoted exclusively to education and research in the field of pulp and paper. In addition to a large number of special purpose laboratories and highly sophisticated scientific equipment, the department maintains an experimental pulp and paper mill equipped with machinery and instrumentation for studies of pulping, pulp purification, reuse of secondary fibers, refining, paper additives, and papermaking. This facility includes one 12-inch and one 48-inch fourdrinier paper machine, a number of disk refiners, and a two-pocket grinder for mechanical pulping, and auxiliary equipment. In addition, the Department maintains an environmental engineering laboratory designed to demonstrate various methods used for the recycling of waste paper and the treatment of waste water. Also included is a modern chemical engineering laboratory, used for studies in all phases of unit operations and processes, process control, and analog simulation.

Undergraduate Program

The curriculum is entered at the junior level. Students with an associate degree in engineering science, science and mathematics, or chemical technology usually qualify for admission if their studies have included 8 credit hours of organic chemistry with laboratory. Other applicants with two years of college study may also gain admission if their curriculum includes the appropriate courses, as indicated below:

Lower Division Courses

Course Area	*Credit Hours*
Botany or Biology with Laboratory	4
General Chemistry with Laboratory	8
Organic Chemistry with Laboratory	8
Quantitative Analysis	3
Physics with Laboratory	8
Mathematics—Analytic Geometry and Calculus, Differential Equations Recommended	12
Computer Science	3
Economics	3
English	6
Engineering Drawing	1
Humanities or Social Science Electives	8
TOTAL MINIMUM LOWER DIVISION CREDITS	64

Minor deficiencies can usually be made up during the junior year.

The Paper Science and Engineering curriculum consists primarily of chemical engineering courses and specialized courses relating to the manufacture of pulp and paper products. A detailed listing of these courses is given below:

Upper Division Courses

Junior Year — *Credit Hours*

First Semester	FCH 572	Wood Chemistry II	3
	FCH 360	Physical Chemistry	3
	PSE 300	Introduction to Papermaking	3
	WPE 387	Wood Structure and Properties	3
	PSE 370	Principles of Mass and Energy Balance	3
	PSE 371	Fluid Mechanics	3
			18
Second Semester	PSE 372	Heat Transfer	2
	FCH 361	Physical Chemistry	3
	WPE 388	Wood and Fiber Identification Lab	1
	PSE 301	Pulp and Paper Processes	3
	PSE 302	Pulp and Paper Processes Lab	1
	ERE 377	Process Control	3
	LIB 300	Library Research Methods	1
	*Elective		3
			17

SUMMER MILL EXPERIENCE: PSE 304 Mill Experience 2
(Twelve weeks of full-time pulp or paper mill employment approved by the Department between the junior and senior years.)

Senior Year — *Credit Hours*

First Semester	PSE 461	Pulping Technology	3
	PSE 465	Paper Properties	4
	PSE 473	Mass Transfer	3
	PSE 491	Paper Science and Engineering Project	1
	*Electives		6
			17
Second Semester	PSE 466	Paper Coating and Converting	2
	PSE 468	Papermaking Processes	3
	ERE 440	Water Pollution Engineering	3
	*Electives		6
			14

TOTAL MINIMUM UPPER DIVISION CREDITS 67

*At least 9 hours of electives must be selected from an advisor-approved sequence of technical courses. Examples of suggested areas are shown below.

TECHNICAL ELECTIVES

Colloid and Surface Chemistry
Instrumental Analysis
Polymer Chemistry
Pollution Abatement
Independent Research Project
Applied Mathematics
Computer Modelling
Principles of Management
Mechanics
Engineering Design
Materials Science

A total of 132 credit hours is required to complete the B.S. degree in paper science and engineering.

Graduate Program

Graduate studies reflect the strong trend toward diversification in the industry and offer opportunities for obtaining master of science and doctor of philosophy degrees in a variety of subjects related to the manufacture of pulp and paper. Individual study programs are designed to meet specific personal needs. Typical areas of study range from the development of new pulping processes, chemical interactions on the paper machine and the disposal of pulping and papermaking effluents, to the fluid dynamics of fiber suspensions, the colloid chemistry of papermaking constituents, and the physical properties of fiber networks.

An important component of the graduate program is thesis research under direction of a graduate advisor. Much of this research is carried out under the auspices of one of the outstanding research facilities in the world, the Empire State Paper Research Institute (ESPRI), an integral part of the department. Its research activities aim to generate new information regarding the fundamentals, the science, the engineering and the technology of the papermaking process, utilizing advanced techniques such as electron microscopy, specialized spectrophotometry, nuclear magnetic and electron spin resonance and nuclear tracer methods. Recent work has been directed to fundamental investigations of pulping, bleaching, additives, paper recycling, effluent disposal, the papermaking process, the properties of paper, reactions of wood components during mechanical and chemical treatments, the structure of wood and wood fibers, evaporation, fluid dynamics, heat transfer, and chemical recovery.

Many research projects are carried out in cooperation with other College departments. Examples of such projects include a wide-ranging study of the toxicity of paper industry effluents in cooperation with the Department of Environmental and Forest Biology, and a cooperative project on the theoretical and experimental analysis of the mechanical properties of fiber and paper with the Department of Wood Products Engineering, as well as the Department of Aerospace and Mechanical Engineering at Syracuse University.

The department enjoys excellent external support in the form of graduate fellowships and grants from ESPRI, the Syracuse Pulp and Paper Foundation, and other industry sources, as well as a number of government granting agencies.

WOOD PRODUCTS ENGINEERING

GEORGE H. KYANKA, *Chairman* (Applied Mechanics, Structures) CÔTÉ (Cellular Ultrastructure, Light and Electron Microscopy), DAVIDSON (Physical Properties of Wood), DE ZEEUW (Wood Anatomy, Structure-Property Relations), HANNA (Ultrastructure and Microscopy), J. MEYER (Wood-Polymer Systems Radioisotope Techniques), R. MEYER (Wood Properties and Anatomy), MOORE (Wood Materials Processing and Technology), SIAU (Protective Treatments, Transport Processes), SMITH (Adhesives, Coatings, Wood-based Composites).

While wood is one of the oldest structural materials known to man, it occupies a position of major economic importance today with the annual tonnage of wood produced in the United States exceeding that of any other major structural material. This fact becomes even more important in this age of environmental and ecological concern because wood is the only major structural material that comes from a renewable natural resource, and demand is growing for more efficient utilization of available material. Improved efficiency must be based on solid scientific and engineering information. The Department of Wood Products Engineering provides undergraduate instruction in basic wood science and technology and stresses the application of science and engineering to building construction and the production, design, and utilization of wood-based materials. At the graduate level, the Department provides guidance via advanced courses and research opportunities in wood science and timber engineering.

Undergraduate Program

The Department of Wood Products Engineering prepares students for a wide variety of professional occupations concerned with the use of wood as a material. Two curriculum options are available: Building Construction and Forest Products. Both options have elective courses which permit tailoring the program to serve the needs of individual students from a wide variety of two-year preparatory programs. The Forest Products option is individualized to serve students that wish to emphasize Marketing, Production Systems Engineering, or Wood Science and Technology.

As the only major engineering material derived from a renewable natural resource, wood is receiving increased attention as an alternative to other materials which originate from the depleted nonrenewable resources. Thus, a principal aim of the departmental program is to teach students the fundamental properties of wood as a material to promote efficient wood processing, product design, and final use, whether as a piece of furniture or as a complete building.

To enter either option at the junior level, a transferring student must have acceptable college credit in the following coursework areas. Individuals not meeting the basic outline shown are encouraged to contact the Admissions Office to work out special arrangements and/or additional study requirements:

Lower Division Courses

Course Area	*Credit Hours*
*General Chemistry with Laboratory	4
*General Physics with Laboratory	8
Mathematics—Analytical Geometry and Calculus	8-9
English	6
Recommended Additional Courses	
Accounting	6
Biology or Botany	3-4
Computer Science	3
Economics (Micro- and Macroeconomics)	6
Engineering Drawing (Graphics)	2
Organic Chemistry	3
Electives	16-18
TOTAL MINIMUM LOWER DIVISION CREDITS	62

*Four credits of physics are required, although 8 hours are recommended. However, students who wish to emphasize wood science and technology in the forest products option must have: general chemistry with laboratory (8); general physics with laboratory (8); and general botany with laboratory (4); organic chemistry (3).

The A.S. or A.A.S. degree in Architectural, Civil, Construction, or Mechanical Technology may also fulfill the requirements for admission. Students who lack the above background courses are nevertheless encouraged to consult the Admissions Office and the faculty of the department for an evaluation of their academic records.

Building Construction Option

Current economic pressures are dictating that the construction industry become more efficient in the design and construction of new facilities and structures. These structures range in size from residential structures to massive power generation stations. Consequently, the industry has increased its demand for technically trained professionals who have the skills to manage construction projects. These professionals must be prepared to develop new and innovative construction techniques, deal with a highly organized union work force, prepare competent cost estimates, and manage entire projects from start through completion.

Although the Building Construction curriculum emphasizes the use of wood as a building material, it allows the students an opportunity to develop a broad educational background in construction which will prepare them for a wide range of job positions in the construction industry and related fields. The program has a certain degree of flexibility which allows the student to specialize in a particular area of interest.

Illustrative electives are listed below:

Engineering	*Management*	*Environmental*
Structural Analysis	Marketing	Air Pollution Engineering
Foundation Design	Business Law	Solid Waste Disposal
Building Systems	Accounting	Waste Water Treatment
Energy Systems	Finance	Environmental Sanitation
Engineering Design	Operations Research	Land Use Planning

The following are some of the position titles past graduates now hold:

Assistant Project Superintendent	Timber Engineer
Project Supervisor	Truss Design Engineer
Construction Manager	Research Engineer
Cost Engineer	Construction Consultant
Resource Scheduler	Technical Sales Representative

Upper Division Courses

Junior Year			*Credit Hours*
First Semester	WPE 320	Polymeric Adhesives and Coatings	2
	WPE 321	Adhesives and Coatings Laboratory	1
	WPE 387	Wood Structure and Properties	3
	ERE 371	Surveying for Engineers	3
	ACC 204	Financial Accounting Systems	3
	WPE 361	Statics	3
			15
Second Semester	ERE 362	Mechanics of Materials	3
	ERE 364	Engineering Materials	3
	ACC 252	Introduction to Managerial Accounting	3
	Management Elective Course		3
	Elective or APL Programming		3
			15

INDUSTRIAL FIELD TRIP (a two-week field trip immediately following final exam period): WPE 399 Field Trip 2

Senior Year			*Credit Hours*
First Semester	FEG 410	Structures	4
	CIE 437	Soil Mechanics and Foundations	4
	ERE 496	Professional Development	1
	WPE 454	Construction Management	3
	Probability and Statistics Course		3
	Elective		3
			18
Second Semester	WPE 326	Fluid Treatments	2
	WPE 327	Fluid Treatments Laboratory	1
	WPE 450	Construction Equipment	3
	WPE 422	Composite Materials	3
	Elective		6
			15
		TOTAL MINIMUM UPPER DIVISION CREDITS	65

A total of 127 credit hours is required to complete the B.S. degree in wood products engineering with the building construction option.

Forest Products Option

The forest products option prepares students for employment in the wood products industry. A forest products graduate should be able to walk into any wood products manufacturing operation and, after observing the process be able to fully understand what is going on. Instruction is individualized by selecting emphasis courses that are combined with required core courses designed to develop a comprehensive knowledge and understanding of wood as a raw material. The forest products option trains wood technologists, utilizing an individualized program with a series of emphasis courses to develop additional background in manufacturing, marketing, or specialization in wood science and technology.

Students wishing to enter graduate school can plan a series of electives to meet entrance requirements of major graduate institutions, whether in wood science and technology, business administration, or another branch of the sciences.

Marketing Emphasis

A special knowledge of the material properties of wood and the suitability of specific wood species for use in various products or processes enable a graduate with marketing emphasis to assist a customer in selection of the right wood product for the intended end use or makes possible the procurement of the best wood raw material for some manufacturing operation. These situations include considering the correct species of wood, treatments to prolong the useful life of a wood product, or selection of the most suitable manufactured product, such as medium density fiberboard or plywood, for a specific application. In some cases market research surveys or economic analyses may be required. Complete understanding of the employer's products, the material properties of wood, and the customer's special needs and problems are necessary for the marketing specialist to function efficiently. In addition to many sales-related or purchasing-related positions are other employment possibilities such as those requiring analysis of economic and trade conditions or relating engineering properites of wood to established or new product lines.

Job titles of recent graduates include:

- Veneer Sales Manager
- Technical Sales Representative
- Applications Engineer
- Assistant Sales Manager
- Regional Sales Manager
- Retail Manager
- Export Trade Analyst
- Purchasing Agent
- Product Development Engineer
- Marketing Research Analyst

Production Systems Engineering Emphasis

Numerous manufacturing methods are used to produce the over 5,000 products that use wood in one form or another. By studying various production systems, plant layout, techniques for time and motion studies, engineering properties of wood and ways to modify wood properties, a wood production systems engineer is prepared for a career in the manufacture of forest products (veneer, plywood, particleboard, etc.). These careers deal with product and process development, quality control, production control, design engineering, personnel relations, and management.

Job titles of recent graduates include:

Production Coordinator	Assistant Superintendent
Quality Control Supervisor	Plant Engineer
Plywood Production Manager	Maintenance Supervisor
Shipping Coordinator	Production Supervisor
Expeditor	Lumber Inspector and Grader

Wood Science and Technology Emphasis

Wood science and technology deals with materials science and engineering. Graduates that have stressed the science and technology of wood are prepared to utilize their knowledge of wood in numerous ways: to increase the efficiency of wood use, apply existing or new knowledge to wood product manufacture or utilization, or to do the research and development required for the new products, processes, and treatments necessary to meet the increasing demands made on our limited forest resources for wood commodities. Such research projects could be either basic, in which case the frontiers of wood science are extended, or applied, in which case existing knowledge is applied to current technological problems. Much of the work that needs to be done is technology transfer, so that known techniques of wood science and technology can be applied to the manufacturing or utilization environment. A wood science and technology graduate who has a good background in wood as a material can adapt the present state of knowledge to a broad range of utilization, research, or manufacturing operations. Employment opportunities include corporations, trade associations, government research institutes, and universities. An M.S. degree is highly recommended for those wishing to formally enter the research field, and a Bachelor's degree for those wishing to work in technical service or manufacturing.

Job titles of recent graduates include:

Forest Products Specialist	Forestry Specialist (Wood Products)
Research Technician	Research Associate in Wood Science
Materials Research Associate	Environmental Technician
Wood Products Technologist	Quality Control Supervisor

Upper Division Courses

Junior Year			*Credit Hours*
First Semester	WPE 320	Polymer Adhesives and Coatings	2
	WPE 321	Adhesives and Coatings Laboratory	1
	WPE 322	Mechanical Processing	3
	WPE 361	Engineering Mechanics—Statics	3
	WPE 387	Wood Structure and Properties	3
	WPE 388	Wood and Fiber Identification Laboratory	2
	*Electives		3
			17

			Credit Hours
Second Semester	WPE 326	Fluid Treatments	2
	WPE 327	Fluid Treatments Laboratory	1
	WPE 343	Structural Materials and Elements (Marketing Emphasis) }	3
	ERE 362	Mechanics of Materials }	
	*Computer Programming Course		3
	*Emphasis Course		3
	*Electives		3
			15

INDUSTRIAL FIELD TRIP (a two-week field trip immediately following final exam period): WPE 399 Field Trip ... 2

Senior Year

			Credit Hours
First Semester	Probability and Statistics Course		3
	WPE 497	Seminar	2
	*Emphasis Courses		9
	*Electives		3
			17
Second Semester	FOR 404	Economics of Wood-using Industries	3
	WPE 422	Composite Materials	3
	*Emphasis Courses		6
	*Electives		3
			15
		TOTAL MINIMUM UPPER DIVISION CREDITS	66

*Specific courses selected for these requirements must have the advisor's approval.

A total of 128 credit hours is required to complete the B.S. degree in wood products engineering with the forest products option.

Emphasis Courses

Students desiring to emphasize Marketing, Production Systems Engineering, or Wood Science and Technology should select 24 credit hours of emphasis courses. These courses are defined upon consultation with the academic advisor. Typical concentration areas might be as follows:

Marketing	*Production Systems Engineering*	*Wood Science*
Finance	Probability and Statistics	Tropical Timbers
Accounting	Thermodynamics	Wood Chemistry
Statistics	Quality Control	Physiology and Pathology
Business Law	Engineering Economics	Independent Research
Materials Science	Computer Science	

Graduate Program

Recent research projects in wood ultrastructure have dealt with the interaction of coatings and adhesives with the wood substrate, with cell wall development, with the effectiveness of wood preservatives, and with the identification of natural inclusions in wood. Projects in tropical wood identification and structure-property relations in foreign and domestic timbers are examples of work in the field of systematic wood anatomy. The field of wood physics has had active projects in the permeability of wood and the mechanics of fluid transport. Current projects in the field of mechanics are focused on the elastic behavior of wood and wood-base composites, fracture mechanics of wood, the behavior of new structural designs such as truss systems, and the mechanical properties of laminated-veneer-lumber. In addition, there is growing interest in studying the physical properties of wood-based composite materials and the chemical modification of wood, as well as wood finishing systems.

Laboratory facilities include a mechanical testing laboratory with a wide range of testing machines, a physics laboratory with electronic instrumentation, and complete wood processing facilities including a sawmill, plywood mill, dry kilns, and wood preservation equipment. One of the United States' largest foreign wood collections is used for graduate research and to support the program of the Tropical Timber Information Center (TTIC).

In addition, the College has available a complete microscopy laboratory, containing transmission electron microscopes, scanning electron microscope with energy dispersive x-ray analysis and particulate analysis accessories, a wide variety of light microscopes, and related equipment. Extensive equipment for chemical analysis and nuclear chemical techniques also serve the research program.

THE SCHOOL OF FORESTRY

JOHN V. BERGLUND, *Dean* (Silvics, Silviculture)

ABRAHAMSON (Entomology, Pathology, Pesticides), BENNETT (Economic Theory, Economic Thought in Forestry), BLACK (Watershed Management), BURRY (Forestry Extension, Primary Processing), CANHAM (Economics of Non-Market Forest Resources), CRAUL (Forest Soil Science), CUNIA (Operations Research, Statistics, Mensuration), DALL (Environmental Policy and Law), DREW (Silvics) ESCHNER (Forest Influences), GRATZER (Forest Recreation, Forest Management), GRAVES (Forest Resource Policy, Planning, and Management), HERRINGTON (Meteorology, Urban Forestry), HORN (Forest Business Management, Law), HOWARD (Silvics, Forest Management), KAUFMAN (Tropical Silviculture), KOTEN (Forest Management, Systems Analysis), LARSON (Forest Resource Policy and Administration, International Forestry), LEA (Silviculture, Timber Harvesting), MAYNARD (Tree Improvement), MONTEITH (Forestry Economics, Land Use), MORRISON (Forestry Extension, Outdoor Recreation), NYLAND (Silviculture), PETRICEKS (International Forestry Economics, Macro-economics), RICHARDS (Silviculture, Urban Forestry), SAGE (Huntington Forest), STITELER (Biometry, Experimental Design, Computer Applications), TIERSON (Adirondack Ecological Center), WHITE Forest Soil Science), YAVORSKY (International Forestry).

Adjunct Faculty

CZAPOWSKYJ (Forest Soil Science) HEISLER (Meteorology), HORSELEY (Silvics), MARQUIS (Silviculture).

Undergraduate Program

The School of Forestry prepares students for the critical role of managing forests and related resources and their associated environments for human benefit. Management in this sense embraces the integration of basic ecological and social principles into comprehensive programs of planning, manipulation, and use of forest and open lands for the sustained production of timber, forage, water, wildlife, and recreational values consistent with national needs and the protection and enhancement of environmental quality. It includes, further, the effective implementation of these programs via the administrative process, in accordance with established policies and goals and in cooperation with individuals and organizations, both public and private.

Students completing the School's undergraduate program are qualified for professional practice as foresters and environmental managers with public and private organizations or as private consultants serving a wide array of clients. The potential for a meaningful career in service to human welfare becomes significant when one recognizes the vast amount of land area covered by forests. Nearly 60 percent of New York State is classified as forest land, while roughly one-third of the land area of both the United States and the world is so classified. The goods and services that flow from this vast resource base are of critical and growing importance to the needs of modern society and influence, in a major way, the quality of the environment.

The program also offers opportunity for students to pursue special interests, to prepare for advanced study, or to develop their capabilities for service in a variety of fields pertinent to renewable natural resources and the environment, but not specifically forestry oriented.

A dual-major program is available that meets the undergraduate requirements of both the School of Forestry and the School of Biology, Chemistry and Ecology. (For details see p. 117).

The Resources Management Curriculum

Though it represents the oldest area of professional instruction in the College, the current curriculum was implemented with the entering class in 1973. It is accredited by the Society of American Foresters and meets the minimum educational requirements of the Office of Personnel Management for forester employment in Federal agencies. A core of required upper division courses, totaling 42 semester hours, presents the basic principles and practices that underlie the purposeful management of forest and related resources for optimum production and use of any one, or more, of their potential products and services.

Extensive elective opportunities, totaling over one-fourth of the program, are available to help broaden the student's general education, to strengthen perceptions and integration of knowledge, to enable the student to enhance depth of understanding in areas of forest resource management of special interest, or as a base for subsequent study at the graduate level. Areas of concentration provide meaningful sequences in terms of subject matter coverage. Such areas currently include forest resource science, management science, urban forestry, international forestry, and applied forest resource management within any of which emphasis may be focused on multiple-use forest management, or on single-use values such as timber, forage, watershed, wildlife, recreation, and aesthetics.

Additional areas of concentration may be developed in cooperation with other disciplinary units of the College. Moreover, students need not select a given area of concentration, but may choose elective courses in accordance with their respective interests and needs, the only restriction being that such selections have the approval of the student's faculty advisor.

A significant feature of the elective component of the curriculum in forest resource management is that the spring semester of the senior year consists wholly of electives and thus is available for a variety of independent or group study activities. These may be conducted in whole or in part on any one of the College's several campuses, off campus at another institution, in cooperation with some resource management agency or firm, or in conjunction with an overseas academic program operated by the College. Proposals for off-campus study are subject to faculty review and are carried out with varying degrees of faculty guidance to ensure adherence to academic standards.

Considerable emphasis in the curriculum is placed on field instruction to provide students with intimate knowledge of how the forest ecosystem functions and how it is manipulated and used for a variety of owner objectives. Attendance at a five-week, six-credit hour Summer Session in Field Forestry is required prior to registration for the junior year. This session serves as the major avenue of entrance into the curriculum.

Close to half of the required upper division core courses are conducted wholly or primarily in the forest environment and entail substantial physical activity such as conducting field surveys, inventorying timber and other resources, and thinning forest stands. As part of the conditions for admission to this program, applicants must be willing and able to function effectively in the field under a wide range of terrain and weather conditions. Any questions or concerns about this requirement should be directed to the Director of Admissions.

The curriculum is designed to facilitate the transfer of qualified students from liberal arts and science programs in community colleges and other institutions of higher learning. For students contemplating such transfer, it is required they have completed at least 64 semester credit hours or an associate degree, and further, that they have a minimum of 48 of these credits distributed among specific course areas as outlined below. The maximum number of freshman-sophomore semester credit hours which may be transferred is 64. Up to 12 additional hours of junior-senior level courses may be transferred. The professional forester must understand both the biological and social influences that impinge upon the use of forest resources. Prospective transfer students should choose elective courses that will serve to broaden and enhance their understanding in the social and political sciences, humanities, and communication skills.

Lower Division Courses

Course Area	*Credit Hours*
Biology (Botany and Zoology) with Laboratory	8
General Chemistry with Laboratory	8
General Physics with Laboratory	8
Mathematics, through Integral Calculus	6
*Economics (Macro- and Microeconomics)	6
*Introductory Sociology or Psychology	6
*Political Science (U.S. Institutions)	6
English	6
*Electives	10
TOTAL MINIMUM LOWER DIVISION CREDITS	64

*Students may be admitted with 3 credit hours in each of the following: economics, psychology/sociology, and political science. These deficiencies must be removed as early as possible in the student's program, including the use of summer sessions.

Upper Division Courses

Summer:	[1]ERM 300	Summer Program in Field Forestry	6
Junior Year			*Credit Hours*
First Semester	FOR 331	Introduction to the Physical Environment	6
	FOR 332	Silvics-Silviculture	8
	FOR 322	Forest Mensuration	3
			17
Second Semester	FOR 360	Principles of Management	3
	FOR 370	Management of the Forest Enterprise	3
	Computer Science Course		1
	APM 391	Introduction to Probability and Statistics	3
	[2]Electives		6
			16

Senior Year

			Credit Hours
First Semester	APM 492	Forest Biometrics	3
	FOR 400	The Social Environment of Resource Management	3
	FOR 461	Management Models	3
	[2]Electives		6
			15
Second Semester	[2]Electives		17
			17
		TOTAL MINIMUM UPPER DIVISION CREDITS	71

[1]SUMMER PROGRAM IN FIELD FORESTRY—five weeks, 6 credit hours: Required of all students *prior* to registration for the junior year.

[2]One half of the student's elective hours during the junior and senior years must be in courses taken in no fewer than three of the following Schools: Forestry, Environmental and Resource Engineering; Biology, Chemistry, and Ecology; Landscape Architecture. The remaining elective hours should be used to round out the professional education of a student.

A total of 135 credit hours is required to complete the B.S. degree in resource management.

Graduate Programs

Graduate education in the School of Forestry builds upon the basic foundation of professional knowledge acquired by students in its undergraduate curriculum or in similar or closely allied programs of study. Instruction at this level is designed to prepare students for careers in resource administration, professional education and research, and a variety of other specialized positions in public and private employment bearing directly or indirectly on forest resources management.

The School offers advanced study opportunities under two broad degree programs: Forest Resource Management and Policy, and Silviculture and Forest Influences. In addition, its faculty contribute significantly to several College-wide graduate programs and joint areas of advanced study, including fish and wildlife, managerial science, water resources, environmental planning, environmental science, and soil science.

Several areas of specialization are available within the two degree programs. Opportunity is also provided for students, in consultation with faculty advisors, to arrange areas of study specific to their interests and needs which integrate elements of two or more areas of specialization, as in urban forestry and international forestry. Whatever the program, the basic purpose is to help the student acquire the tools and facility for disciplined, logical, critical, constructive, and creative thinking, and for clear expression in the selected field.

Those prospective graduate students without a Bachelor of Science degree from an accredited forestry school, and desiring to be qualified as a professional forester upon completion of their program, will need to include certain of the required undergraduate forestry courses and the summer field forestry program for nondegree credit, together with certain required graduate courses. The mix of undergraduate and graduate courses required will depend primarily upon the science background of the student. Students with this goal in mind should expect to spend at least two and one-half to three years to complete the MS degree in either of the two graduate programs in the School of Forestry. The Ph.D. program would be extended accordingly.

Prospective students who desire more information than is presented for each of the graduate programs and specialties described below should contact the Dean, School of Forestry.

RESOURCE MANAGEMENT AND POLICY (RMP)

The objective of the RMP program is to prepare graduates at the Master's or Ph.D. level with a sufficient depth and breadth of understanding so that they will be able to function in and ultimately make significant contributions to the field of resource management and policy. This field is extremely diverse and includes employment opportunities with private firms that own, manage, and/or use natural resources, a myriad of public agencies from the federal to the local level, teaching opportunities in forestry or natural resource programs, or research work as conducted by a number of public and private agencies. Furthermore, students may choose to concentrate study in a particular specialty area of the field, or to prepare themselves more broadly for traditional managerial duties.

Each of these possibilities demands different interests and talents on the part of the student and different types of preparation in the course of graduate study. For these reasons our entering students are expected to have made a searching self-analysis of their abilities, potentials, and ambitions so they can enter the program with well defined career goals and utilize the graduate experience to its best advantage. The RMP program differs from the more science oriented offerings of the College in that while technical competence is expected, students are additionally required to relate this competence to the social and political environment in which they will be functioning. The student's interest must be broad enough to encompass these social areas, or be prepared to devote some study to these subjects while in residence.

The expertise of the RMP faculty is in the area of management, policy and economics as it relates to forest and associated natural resources. It is expected that students entering the program will share similar interests and concentrate their studies in this broadly defined field. However, the resources of Syracuse University's School of Management and Maxwell School of Public Administration are available to our students, and graduate level courses in the more general area of management and policy may be taken in these schools when appropriate to the student's overall graduate program.

As previously described, the RMP program is individualized to meet the scholastic and career goals of the student within the capabilities of the faculty. Faculty strength and student interest over the years have been highest in the following concentrations, and they are described as illustrative of the type of graduate study available to entering students.

FOREST MANAGEMENT

Forest management focuses on the planning and implementation processes necessary to achieve integrated use of forests and associated natural resources. The educational objective is to develop expertise sufficient for capable, professional resource management under a variety of natural and societal environments.

The study of forest management requires a broad knowledge of both the natural and social environments as the basis for an understanding of the way in which these environments affect or are affected by the development and utilization of forests and associated wildlands. Implementation of plans also requires an understanding of the social environment as well as the managerial process to facilitate working with people both inside and outside of the organization.

Programs are flexible and a student may pursue a special interest in a single product, several products or services, tools and processes of planning for integrated forest use, or in developing managerial skills. The emphasis of the program, however, would be in the application of the skills and knowledge to the management of forest lands. Where appropriate, courses may be taken at Syracuse University's School of Management and the Maxwell School of Public Administration to complement course offerings in the School of Forestry and other Schools of the College. Recent graduates have found employment in all of the diverse areas described above.

POLICY AND ADMINISTRATION

Graduate study in the area of resources policy and administration is designed to prepare students for leadership positions in the broad range of responsibilities at the planning, budgeting, programming, and operating levels of public agencies and businesses. The expanded role of federal and state government oversight over resource use and land management has brought substantially increased need for thorough understanding of policy matters, legal requirements, and governmental and political interactions with resource owners and users. Advanced courses, seminars and special problems structured around these needs and the complex interrelationships of society with resources are offered. A wide array of complex problems of administrative management, resources policy issues, and related legal, financial, and executive needs are included among the topics that may be emphasized.

Students are encouraged to round out their academic programs through the courses offered by other units of the College as well as Syracuse University Graduate School of Citizenship and Public Affairs and the School of Management or other graduate units. Students with undergraduate preparation in forestry, liberal arts, engineering, or other appropriate areas who have strong interest in resource administration and policy can be served through selection of necessary emphases that complement work already taken.

The broad array of possibilities of course selection and the diverse points of view that are available allow the student to build a program to meet specific career objectives. The breadth and diversity also offers the student an opportunity to develop talents for managerial leadership and policy positions in various aspects of enterprises and public agencies whose work is critical to the future of resources management.

FORESTRY ECONOMICS

The program is designed to meet the needs of the student with an undergraduate degree in forestry or forest products. With some additional courses in forestry, the program also serves the graduate in liberal arts, engineering, or business, should interest point toward the economics of forest management. The goals are depth of understanding and familiarity with economic tools contributing to making competent decisions in resource economics, management, and policy.

The core of the program consists of courses in forestry and resource economics as offered by School faculty. In addition, one must be aware of the social and biological environment in which forestry economics is applied. To this end the program is supplemented by courses in general economics, statistics and operations research, resource policy, business administration, and related managerial and biological fields. The course offerings and facilities of the School, the rest of the College, and Syracuse University are actively drawn upon.

Individual programs are tailored to fit the student's particular interest: for example, the economics of timber management, land use economics, economics of natural environments, economic development and forestry. Graduates with the Master's degree find employment typically as forest economists or resource analysts with federal and state agencies, and with private industry. Graduates with the Ph.D. usually find careers in teaching or research.

RECREATION MANAGEMENT

Graduate study in this area equips students with a broad understanding of the nature and purposes of outdoor recreation and how they relate to natural resources, and builds the skills necessary for capable recreation management.

Individual programs combine study in resources management with relevant studies in the social and political sciences and development of analytical capabilities needed to implement plans and programs. Other schools of the College and of Syracuse University, treating such areas as planning, engineering, design, and education, provide a wide range of supporting courses and facilities.

All program areas in RMP require that each student take a minimum of 12 credits of coursework within the School of Forestry. Courses in Applied Mathematics (APM) can also be used to meet this requirement. If a student's prior preparation is inadequate to meet the graduate program objectives, the major professor and/or committee will suggest appropriate remedial coursework to make up the deficiency.

Master's Degree Program

All three Masters' options are available to students in the RMP program. Although differing in format, the options have the common purpose of bringing each student to a similar level of understanding and ability in his chosen field. Because each option emphasizes a different element of the total program goals, the choice of an option should be based primarily upon a student's career objectives.

In the case of option 2, Academic or Professional Experience, the RMP faculty has chosen to increase the coursework requirement to 30 credit hours. At the present time the use of this option is limited to situations where appropriate experience can be negotiated between a student and an outside institution.

Ph.D. Degree Program

Requirements for the doctorate usually build upon a master's degree, and demand a substantial mastery of material related to the dissertation topic. At the same time, a number of other fields are chosen to support or integrate the selected central topic of doctoral study. There is no minimum credit requirement, but the normal course workload is 30 credits and a minimum of 12 credits of coursework must be taken within the School of Forestry. The field work for and the writing of a dissertation usually requires a minimum of 12 months.

The additional requirements for a doctoral program, beyond a master's degree are the passing of written and oral candidacy examinations which are intended to test the student's integration of subject matter, and the writing and successful defense of a dissertation. A preliminary examination may be required to make an early appraisal of the student's intellectual qualifications to determine levels of understanding of the scientific and technical disciplines he is studying, and to guide the development of an adequate program of study.

SILVICULTURE AND FOREST INFLUENCES

Concern for the forest ecosystem provides a major focus for graduate study in the Silviculture and Forest Influences Program. This ecosystem is viewed as a producer of goods and services and as a modifier of the physical environment in which man lives. It is in this context that translation of these concerns to broader questions of environmental quality is emphasized.

Silviculture in its functional sense is the bridge between fundamental biological and physical relationships and the applications of these relationships in the forest environment. Thus, graduate study in the many aspects of silviculture can cover a broad spectrum of disciplines, and can be as basic or as applied as the objectives of the student indicate. Individual study programs are coordinated with various areas of specialization both within the School of Forestry and with other departments of the College, of the State University of New York, and with Syracuse University. A major strength is the close association of faculty scientists, representing a wide range of specialties, and the formal and informal cooperative arrangements they have developed with their counterparts in federal and state agencies, and in industry.

Physical facilities that are routinely used in graduate study within the Silviculture Program include well-equipped laboratories, specialized equipment, greenhouse facilities, and extensive College forests.On these 25,000 acres of forestlands are located natural and planted stands, seed orchards, a forest tree nursery, and two large micro-climate tower complexes with associated automated data acquisition systems and instrumentation. Major field installations include long-term northern hardwood stand improvement studies and the oldest continuous forest fertilization study in the United States. Cooperative arrangements also exist for work on corporate lands, private properties, and governmental ownerships.

Qualifications for Admission

In addition to the general College-wide requirements for admission to graduate study, applicants to the graduate program in Silviculture and Forest Influences should have prior education or experience in resource management and have a deep personal commitment to forest resource management as a career goal. Students with preparatory deficiencies may be permitted to take corrective coursework.

Minimum Requirements

MASTER OF SCIENCE

Candidates for the master of science degree are required to complete 30 semester hours of graduate work beyond the baccalaureate degree. From 6 to 12 semester hours of this total can be credited for writing and defending a thesis.

This graduate degree is intended for students seeking an intermediate level of education in a scientific, professional, or technological field. It provides an introduction to research and related scholarly or professional activities and requires the student to demonstrate competence in a selected field of study. Consideration may be given to the development of a study program that provides a foundation for continuation to the Ph.D. degree, or provides an advanced professional education in forestry and serves as preparation for a career requiring special technical ability, or familiarity with research techniques.

Most Master's candidates will be expected to prepare a thesis to satisfy requirements for the completion of the Silviculture and Forest Influences program. The topic addressed by the student should be research oriented, and expand or clarify knowledge in a particular field with some opportunity for generalizing the results. A student may, with the consent of the major professor and advisory committee, petition the School Executive Committee to elect a program of 42 credit hours of graduate coursework and a comprehensive examination. The petition must be submitted prior to completing 12 credits of graduate coursework.

DOCTOR OF PHILOSOPHY

The Ph.D. program usually builds upon a master's degree and demands mastery of material in a specialized field as well as the integration of a number of supporting fields. It requires scholarship of a high order, and successful fulfillment of independent research that makes an original contribution to forestry science.

The degree provides for advanced scientific study and development of the capability to independently organize and conduct research. Graduates fill a variety of positions in research, research administration, teaching and consulting in public agencies, private corporations, universities and foundations.

Students must develop strong scientific capabilities and demonstrate a capacity to solve complex problems in research. They must demonstrate a capability for independent work, but must interact effectively with faculty and other scientists in their chosen field of specialization.

There is no minimum credit requirement, but the normal course workload is 30 graduate credits beyond the master's degree. In addition, the fieldwork for and the writing of the dissertation usually requires a minimum of 12 months.

Candidates for the Ph.D. degree must pass a written and oral candidacy examination, and write and defend a dissertation.

Doctoral candidates are required to demonstrate competency in one foreign language and statistics.

Fields of Specialization

Included within the Silviculture and Forest Influences Program are five fields of specialization that, singly or in combination, provide the graduate student with a wide array of coursework, research activities, and faculty guidance all aimed at enhancing understanding of the forest ecosystem. These specializations are silvics, silviculture, forest soil science, tree improvement, and forest influences. Students in the program can direct their studies toward careers in professional practice, research, or education. Similarly, study in these specialty areas can emphasize any of a number of areas of professional application, such as public or private forest management, urban forestry, or international forestry, depending on the individual's interest.

SILVICS

Silvics has been defined as that branch of forestry which provides the scientific base for the cultural treatment of forest vegetation by (1) studying and defining interrelationships within forest ecosystems and (2) cataloging general intraspecific characteristics of tree species. In a sense, silvics is the ecology of managed forest ecosystems, although unmanaged and natural forests are often studied intensively to provide the benchmark conditions from which the silviculturist begins.

The specialist in silvics must maintain channels of communication with colleagues in the basic disciplines, including those in soil physics, soil chemistry, micro-meteorology and climatology, genetics and tree breeding, plant ecology and physiology, wildlife biology, entomology, and pathology. In addition, certain tools, including a comprehensive knowledge of probability and statistics, the ability to use modern computers effectively, and a familiarity with measurement and sampling theory, are required by specialists in most applied sciences including silvics.

The specialist in silvics is essentially at one focal point of much of what has been called fundamental forest research. His most useful function and worthwhile contribution to the field of forestry may very well depend on the ability to synthesize relevant material and, through experimentation, provide the silviculturist with information and possible techniques for use in the cultural treatment of forest vegetation.

SILVICULTURE

Classical silviculture can be defined as the theory and practice of the manipulation of forest ecosystems, including the control of vegetation establishment, composition, growth, and quality. The nature of cultural treatments, the theories upon which they are based, and the biological, physical, and social constraints to their implementation are stressed in this area of specialization. Elements of forest vegetation are intensively examined from the dual standpoints of fulfilling management goals for goods and services and maintaining or enhancing biotic productivity for the future.

Management goals are considered to include all the many and varied goods and services that the basic forest resource is capable of supplying. Forest productivity is of basic concern; the student specializing in this area progresses through formal coursework and research toward an understanding of the effect of various treatments on the continuous, balanced, and adequate supplies of wood, water, wildlife, recreation opportunities, and amenity values. One major area of emphasis within this specialization relates to treatment of tree stands for their continued production of wood products and other commodities. Another emphasis centers on the treatment of stands that are managed for several values simultaneously, where the harmonious integration of uses is of concern. A third emphasis focuses on evalution and manipulation of vegetation systems primarily for their on-site values, such as in wilderness and recreation areas, highway and utility rights-of-way, mining and other wasteland reclamation, and urban greenspace. This involves a broad interpretation of forest ecosystems that includes herbaceous and shrub systems as well as silvics.

The Silviculture graduate specialization is aimed at preparing foresters to understand and evaluate forest ecosystems in whatever depth may be required, and to prescribe treatments or further experimentation to attain management objectives or increase knowledge toward this end.

FOREST SOIL SCIENCE

Graduate studies in this area of specialization may be directed toward aspects of soil science related to the quantity and/or quality of goods and services in the management of resources of nonagricultural lands, and the impact of managment practices on environmental quality. These include soil moisture, soil temperature, and nutrient element status interrelationships in the evaluation of soil productivity; evaluation of ecosystems to quantify nutrient element balances and cycling; amelioration of soils for increased productivity; and impact of various land-use practices on soil productivity.

Modern well-equipped laboratories are available for graduate student use in plant, soil, and water chemical analyses; soil water-holding capacity and compaction; infiltration and runoff; and other chemical and physical property investigations. The extensive College properties noted previously permit forest soil research to be conducted under a wide variety of environments and ecological conditions.

Programs are coordinated with other areas of specialization through cooperation among school personnel, with other departments of the College, Syracuse University, and the U.S. Forest Service.

TREE IMPROVEMENT

Tree improvement has become an important component of intensive forestry practice. Its main objective is to breed for commercial distribution varieties of trees that are well adapted to such specified conditions as management objectives, cultural practices, and physical and biological site factors. As a specialized study area, it draws upon such fields as genetics, plant biochemistry and physiology, and statistics.

FOREST INFLUENCES

Forest influences as an area of graduate study includes all the effects resulting from the presence of forest trees and associated vegetation on climate, the hydrologic cycle, erosion, floods, and soil productivity. Health considerations and human comfort have often been included in older definitions of forest influences, and are assuming greater importance today with our growing concern for the environment.

Included among the principal studies in this area are energy exchange between forest and atmospheres; moderation of urban environments by vegetation; soil and slope stability; and watershed hydrology, including snow.

Graduates fill a variety of positions in research, teaching, and public and private management as watershed management specialists, hydrologists, environmental officers, meteorologists, and ecologists.

SCHOOL-WIDE AREAS OF STUDY

INTERNATIONAL FORESTRY

Graduate education in international forestry as an area of emphasis is available to students under both the Forest Resource Management and Policy, and Silviculture and Forest Influences programs and is designed to assist individuals who are intent upon pursuing internationally-oriented careers in forestry and related fields.

Instruction is aimed at supplementing and enriching the student's technical forestry knowledge and providing the broad background deemed necessary for effective service in a variety of professional areas. These include forestry advisor, teacher, or research specialist with national and international agencies, private business and industrial firms, philanthropic foundations, and voluntary service organizations whose activities include the development and use of forest resources in other lands.

At the master's level, program emphasis is on the attainment of general competence in research methods, foreign languages, cultural anthropology, world geography, and international affairs, plus a broad understanding of the world forestry situation. At the doctoral level, program concentration is on a specialized discipline area such as forestry economics, forest policy and administration, forest management, or silviculture. Orientation to the world forestry field is achieved in part through the selection of formal coursework, and in part through providing an opportunity for the student to conduct his thesis research in residence abroad.

A wide variety of course offerings are available to support the nonforestry elements of this area of study through Syracuse University. Opportunity for field training and research in tropical forestry and related fields is available to qualified candidates, especially at the doctoral level, under cooperative agreements maintained by the College with the Institute of Tropical Forestry in Puerto Rico and the University of the Andes, Merida, Venezuela.

URBAN FORESTRY

Graduate study in urban forestry allows the student to pursue either of two broad objectives. Professional Urban Forestry skills may be broadened in the many areas of information important to the practice of forestry in urban and urbanizing areas through advanced coursework and applied research. More specialized study may be pursued in scientific disciplines supporting the practice of urban forestry. Active areas of specialized research and study in the School includes soils, greenspace ecology, atmospheric science, tree improvement, forest resource inventory and evaluation, and resource economics and planning. There is strong interaction with other urban-related areas of study within the College, including remote sensing, botany, pathology, entomology, wildlife ecology, and landscape architecture. Academic departments in the Maxwell School of Public Affairs at Syracuse University such as Geography, Economics, Political Science and Sociology, cooperate with teaching and research programs in urban forestry. The U.S. Forest Service, Northeastern Forest Experiment Station, maintains a permanent staff of scientists in their Urban Forest Research Project on campus who are engaged in studies dealing with the planning and management of urban forest ecosystems. This work complements the College's participation as one of nine universities in the Consortium for Environmental Forestry Studies, an organization of scientists and graduate students studying a wide range of problems in urban forestry.

QUANTITATIVE METHODS

Study in the area of quantitative methods is designed to develop professionals skilled in mathematical and statistical problem solution and equipped to act as biomatricians or mensurationists.

The program is designed primarily for students who have done their undergraduate work in areas such as biological sciences, forestry, wildlife, or agriculture. Others who lack background courses may take this material concurrently. Students may concentrate in statistics, operations research, biometry, or forest mensuration. Syracuse University's computer facility and a wide range of courses in mathematics, statistics, and quantitative methods give strong support to the program.

THE SCHOOL OF LANDSCAPE ARCHITECTURE

ROBERT G. REIMANN, *Dean*

FACULTY

GEORGE W. CURRY. *Professional Experience*: The Reimann-Buechner Partnership, Landscape Architects, Syracuse; The Curry-Paulo Partnership; Member, Syracuse Conservation Advisory Council, Syracuse Urban Cultural Parks Advisory Committee, and Chairman, Syracuse Landmark Preservation Board. Licensed Landscape Architect, New York State. *Fields of Specialization*: Site Planning, Urban Analysis and Design, Historic Preservation.

GEORGE F. EARLE. *Professional Experience*: School of Architecture, Syracuse University; Artist; President, World Affairs Council. *Fields of Specialization*: History of Art, Cultural History; Painting, Latin American Art; History of Landscape Architecture; Design; Pre-Colombian Art.

JOHN P. FELLEMAN. *Professional Experience*: Planning Engineer, Monroe County, N.Y.; Urban Planner, NYS Hudson River Valley Commission; Chief Planner, Bruce Howlett, Inc.; Partner, Impact Consultants; Licensed Professional Engineer, New York State; Designated Planner-in-Charge, New York State. *Fields of Specialization*: Site Systems Engineering; Route Location; Environmental Simulation.

CLAUDE C. FREEMAN. *Professional Experience*: Russell Bailey and Associates, Landscape Architects and Planners; Alfred Obrist, Landscape Architect and Civil Engineer. *Fields of Specialization*: Site Design, Plant Materials, Graphics.

DAVID L. HANSELMAN. *Professional Experience*: Ohio Department of Education, Ohio Department of Natural Resources, Ohio State University. *Fields of Specialization*: Communications Strategies and Message Design, Non-Print Communications.

RICHARD S. HAWKS. *Professional Experience*: EDAW, Inc., Cambridge Research Institute. *Fields of Specialization*: Regional Planning and Design, Facility Siting and Routing, Geographic Digital Data Banks.

ALLEN R. LEWIS. *Professional Experience*: Bucks County Planning Commission, Pennsylvania. Member, American Institute of Certified Planners. *Fields of Specialization*: Community Planning; Planning Theory; System Dynamics; Modeling and Simulation.

FRANK L. MARAVIGLIA. *Professional Experience*: Senior High School Teacher; Business and Management Consultant; President, Centre of Applied Creativity, Baltimore, Maryland; Faculty, Annual Creative Problem Solving Institute, SUNY Buffalo, Organizational Communication. *Fields of Specialization*: Technical Graphics, Creative Problem Solving, Education, Communication, Video, Management.

VINEETA MEHRA. *Professional Experience*: North Carolina State University; School of Planning and Architecture, New Delhi, India. *Fields of Specialization*: Landscape Design, Landscape Materials and Construction, Plant Materials, Landscape Engineering, Residential Landscaping.

RICHARD T. MURPHY. *Professional Experience*: Research Analyst, Minnesota Center for Urban and Regional Affairs; Landscape Architect, W. Butler Engineering Company; Partner, Murphy-Lindberg, Landscape Architects. *Fields of Specialization*: Environmental Land Use Planning, Regional Resource Analysis Methods, Energy and Land Use Planning Design.

JAMES F. PALMER. *Professional Experience*: Research Associate, The Environmental Institute, University of Massachusetts; Associate Social Scientist and Resource Planner, Carlozzi, Sinton & Vilkilis, Inc.; College Planner, Kresge College, University of California at Santa Cruz. *Fields of Specialization*: Landscape Perception, Design Evaluation, Social Impact Assessment, Environment and Behavior Research Methods.

RICHARD C. SMARDON. *Professional Experience*: Wallace, Floyd, Ellenzweig, Inc., Cambridge, Mass.; Executive Office of Environmental Affairs, Commonwealth of Massachusetts; Oregon State University Extension Service; Institute for Urban and Regional Development, University of California; USDA Forest Service. *Fields of Specialization*: Landscape and Environmental Planning, Visual Resource Analysis, Environmental Assessment/Administration, Wetland Assessment.

DANIEL A. SUNDQUIST. *Professional Experience*: American Peace Corps; EDAW, Inc., University of New Hampshire. *Fields of Specialization*: Site Planning and Design, Environmental Impact Assessment, Siting and Routing, Synaesthetics.

Introduction

The alteration of the physical environment has been a product of human activity since the earliest times of human settlement. While environments of enduring beauty and vitality occasionally resulted, the history of environmental manipulation more often demonstrated degradation and abuse of the landscape. As the knowledge of natural and human processes has expanded, environmental change has been transformed over the centuries from the casual efforts of many to that requiring skilled individual effort and often demanding multidisciplinary attention.

The School of Landscape Architecture offers curricula designed to educate students to contribute in varied ways to the wise use of land and landscape. Each degree program provides a basis for students to establish career directions in landscape architecture or in related disciplines. These curricula are offered at both the undergraduate and graduate levels.

UNDERGRADUATE PROGRAM

The School of Landscape Architecture offers two undergraduate degrees—the bachelor of science with a major in environmental studies (B.S.) and the Bachelor of Landscape Architecture (B.L.A.).

Both degrees share the ultimate purpose of providing senior level education for those concerned with the condition and form of the physical environment. The B.S. degree is basically designed for those students desiring a general undergraduate degree to be followed by an environmentally related graduate degree. The B.L.A. degree is basically designed for those students desiring to enter the profession of landscape architecture either directly after completing this degree or after completing a graduate degree. Students are urged to seek complete clarification of the two degree programs with regard to their own career goals by arranging an interview with the School.

Recently approved curriculum changes will require students to apply for either the B.S. or B.L.A. degree upon application to the College, beginning with the 1983-84 academic year. In the interim, direct entry into either of the two degree programs is possible with faculty approval at the time of admission.

BACHELOR OF SCIENCE IN ENVIRONMENTAL STUDIES

The B.S. in Environmental Studies degree is a preprofessional degree. It provides an opportunity to address a range of environmental issues within a broad field. The environmental studies curriculum normally does not lead directly into professional employment or prepare for entry into specific environmental career tracks upon award of the B.S. degree. Rather, this curriculum is intended for students wishing to pursue professional study at the graduate level. A few students who enter with unique experiences do find professional employment upon graduation. Other students find opportunities for nonprofessional employment in the environmental sector. Some students gain experience in a preprofessional position for a couple of years before entering graduate school.

The B.S. in E.S. degree is granted at the end of four years and requires the successful completion of 125 credit hours. Students enter into the junior year of the program with a minimum of 62 lower division credit hours and follow the prescribed curriculum.

The B.S. in Environmental Studies program is concerned with the relationships among environment, people, and institutions. Its focus is on the issues involved in the condition and form of the physical environment. The program consists of a common core of courses and two major concentration areas through which the student can investigate specific environmental concerns directly related to individual career purposes and goals. Additionally, students are required to participate in a senior experience during the spring semester of the senior year. The objective of this degree is to provide knowledge in basic principles and processes that influence the condition and form of the physical environment.

The complexity and scope of coursework required in the B.S. degree demands both discipline and commitment from students seeking the degree. Clear purpose and objectives are necessary to beneficially engage the curriculum. To successfully meet each student's objectives, a close-working relationship between faculty and student is necessary.

Students receiving the B.S. degree have pursued graduate study in the disciplines of planning, landscape architecture, and other environmentally related areas such as law and education. Students with academic standing in the top one-third of their class may apply for advance standing admission to the School's M.L.A. program, with its focus on community design and planning, in the fall of their senior year.

Prerequisites for Entry into the B.S. in Environmental Studies Program

Because of the wide range of opportunities available to students who enter the B.S. degree program, it is important that entering students prepare themselves with a broad range of lower division coursework. The issues involved in the condition and form of the physical environment require a background in the humanities, social sciences, and natural sciences. The following required and recommended prerequisite coursework will prepare the entering student to engage the B.S. curriculum.

Prerequisites through Fall 1982:

Lower Division Courses

Course Area	*Credit Hours*
Written and Oral Communication . . . . Required credit hours in this area should be taken in courses dealing with English comprehension, the basic skills of grammar and composition, and public speaking.	3
Natural Sciences . . . . Required credit hours in this area must include a course in general biology. Additional hours should be taken from coursework in ecology, physical geography, earth science, geology, or environmental geology.	6
Social Science . . . . Required credit hours in this area should be taken from coursework in U.S. history, sociology, social psychology, social or cultural anthropology, political science, or economics.	3
Analytical Skills . . . . Required credit hours in this area should include, as a minimum, coursework in college level algebra or trigonometry. Additional hours should be taken from coursework in computer science and statistics.	3
Electives	47
TOTAL MINIMUM LOWER DIVISION CREDITS	62

In selecting courses for the 47 credit hours of electives, students should use the notes listed under the four major course areas above, as well as the prerequisites starting Fall 1983 listed below.

Prerequisites starting Fall 1983:

Lower Division Courses

Course Area	*Credit Hours*
Written Communications Required credit hours in this area should be taken in courses dealing with English comprehension, the basic skills of grammar and composition.	3
Humanities Required credit hours in this area should be taken in coursework in philosophy, literature, art, music, drama, and language.	9
Social Sciences Required credit hours in this area should be taken in coursework in history (preferably U.S.), cultural geography, sociology, psychology, political science (preferably U.S. institutions), social or cultural anthropology, or economics.	9
Natural Sciences Required credit hours in this area must include a course in general biology. Additional hours should be taken from coursework in ecology, physical geography, earth science, geology, and biology.	6
Analytical Skills Required credit hours in this area should include, as a minimum, coursework in college level algebra or trigonometry. Additional hours should be taken from coursework in computer science and statistics.	3
Electives	32
TOTAL MINIMUM LOWER DIVISION CREDITS	62

NOTE: Applicants may be required to submit a statement of program interest.

Bachelor of Science in Environmental Studies Curriculum

I. CORE GROUP REQUIREMENTS

Credit Hours

A. *CONTINUING SKILLS DEVELOPMENT*

i. Written Communication 4
Three credit hours in report writing or equivalent and library research are required.

ii. Quantitative and Computer 2-3
Two to three credit hours in statistics or in computer programming or computer applications are required.

B. *METHODS AND TECHNIQUES* 3
Three credit hours in methods and techniques which are related to applications of information to environmental studies issues.

C. *CONCEPTS AND SYSTEMS* 9
Three courses are required:
EST 100 Introduction to Environmental Studies (3)
LSA 320 Introduction to Landscape Architecture and Planning (3)
EIN 451 Fundamentals of City and Regional Planning (3)

D. *NATURAL SCIENCE AND APPLICATIONS* 9
Nine credit hours are required including:
EIN 311 Natural Processes in Planning and Design

E. *HUMAN-INSTITUTIONAL ASPECTS* 6
Six hours are required including:
EIN 390 Social/Cultural Influences and Environmental Form (3)
and
EIN 371 History of American Landscape Attitudes (3)
or
EIN 471 History of Landscape Architecture (3)

II. CONCENTRATION GROUP REQUIREMENTS 18
Two concentration groups of nine hours each are chosen by the student with the approval of a faculty advisor. The concentrations are related to the human-institution-environment relationship and the role of the design and planning professions in influencing this relationship with respect to resultant physical form. The concentrations will be developed by the School faculty from course-work available at the College and at Syracuse University.

III. DIRECTED ELECTIVES 8-9
Eight-nine hours of electives are available which may augment core and concentration group requirements or senior experience requirements. They are selected in consultation with the faculty advisor.

IV. SENIOR-YEAR EXPERIENCE 3
Several alternatives exist for a senior-year experience which meet the student's academic needs, including a senior research paper, independent readings and report, an internship, a field trip, or an off-campus study. Each option has its own prerequisites and some have limited enrollments.

Total Credits 63

The curriculum in sequential form:

Junior Year *Credit Hours*

First Semester	EST 100	Introduction to Environmental Studies	3
	LSA 320	Introduction to Landscape Architecture and Planning	3
	[3]EIN 311	Natural Processes in Planning and Design	3
	[1]LIB 300	Library Research	1
	[1]ENG 406	Technical Writing	3
	[5]Elective		2
			15
Second Semester	[4]EIN 371	History of American Landscape Attitudes	3
	[4]EIN 390	Social/Cultural Influences and Environmental Form	3
	[2]LSA 330	Site Research and Analysis	2
	[2]ERE 306	Elements of Map and Air Photo Interpretation	1
	[6]Elective	Concentration #1	3
	[6]Elective	Concentration #2	3
	[3]Elective		3
			18

Senior Year *Credit Hours*

First Semester	EIN 451	Fundamentals of City and Regional Planning	3
	Elective	Concentration #1	3
	[6]Elective	Concentration #2	3
	[1]Elective		3
	[3]Elective		3
			15
Second Semester	Senior	Experience	3
	[6]Elective	Concentration #1	3
	[6]Elective	Concentration #2	3
	[5]Elective		6
			15

A total of 125 credit hours is required to complete the B.S. in Environmental Studies degree.

1. Skills development requirements could be satisfied by taking LIB 300, ENG 406, and a computer/statistics course.
2. Methods and techniques requirements could be satisfied by taking LSA 330 and ERE 306.
3. Natural science and applications requirements are satisfied by taking EIN 311 and two additional courses in this area.
4. Requirements for man-institutional aspects are satisfied by taking EIN 371 or 471 and EIN 390.
5. Directed electives—may augment core and concentration group requirements or senior experience.
6. Concentration requirement—two concentration areas of nine hours each are chosen by the student. The concentrations relate human-institution-environment relationships to the form and condition of the physical environment.

NOTE: A number of the courses listed in the B.S. in E.S. curriculum are in the process of being revised. Upon revision, new course descriptions will be available after approval by the College of Environmental Science and Forestry Faculty.

BACHELOR OF LANDSCAPE ARCHITECTURE

The B.L.A. degree is a professional degree with an emphasis on the skills and knowledge required to qualify as a landscape architect. The degree is accredited by the American Society of Landscape Architects (ASLA) as the first professional degree offered at the School. The B.L.A. is granted at the end of five years of study and requires the successful completion of 160 credit hours. Students enter into the third year of the program with a minimum of 62 lower division credit hours and follow the prescribed curriculum.

The B.L.A. degree program consists of a core of courses involving the basic principles and skills of landscape architecture design, land manipulation and engineering, applied ecology, and communications. Additionally, students are required to participate in an independent study semester of the Off-Campus Program during the fall semester of the fifth year. The major objective of the B.L.A. program is the development of basic proficiency in design, engineering, and communication skills necessary for formal admission into the profession of landscape architecture.

When the prerequisite period of work experience has been completed, a person holding a B.L.A. degree may obtain a license to practice landscape architecture. At present, the State of New York requires those holding a 5th-year B.L.A. degree to complete a three-year period of internship in the field prior to applying for the licensing examination. Other states have varying requirements for obtaining a license.

As in any area of professional study, students seeking the B.L.A. degree are expected to demonstrate a high level of commitment and scholarship in their studies. This professional commitment is demonstrated by a desire to serve society in an objective, rational, and ethical manner in designing the form of the environment.

Students receiving a B.L.A. degree have entered the profession as employees in public agencies or in private offices offering landscape architectural services. Also, B.L.A. graduates have entered graduate schools in landscape architecture, planning, urban design, regional design, and specific specialties including historic preservation, energy conservation, environmental policy management and research.

Prerequisites for Entry into the B.L.A. Degree Program

Because of the breadth of concern of the B.L.A. degree, it is imperative that entering students prepare themselves with a broad range of lower division coursework. The environmental efforts with which the students will be involved require a strong background in both the natural and social sciences. In addition, prior skill development in graphics, mathematics, and computer science is required. The following required and recommended prerequisite coursework will prepare the entering student to engage the B.L.A. curriculum.

Lower Division Courses

Course Area	*Credit Hours*
Written and Oral Communication Required credit hours in this area should be taken in courses dealing with English comprehension, the basic skills of grammar and composition, and public speaking.	6
Graphics A minimum of one semester's work preferably in a course in engineering drawing, mechanical drawing, or architectural drafting may be selected.	3
Natural Sciences Required credit hours in this area must include a course in botany or plant biology. Additional hours should be taken from coursework in ecology*, physical geography, earth science, geology, or environmental geology.	6
Social Sciences Required credit hours in this area are to be taken from coursework in U.S. history, sociology, social psychology, social or cultural anthropology, political science, or economics.	3
Mathematics Required coverage of college algebra and trigonometry. Students with prior coverage in math who can demonstrate proficiency at time of admission may substitute elective hours for this prerequisite. More advanced math is desirable but not required.	6
Computer Science (Required in Fall 1983) Required course must include introduction to programming utilizing BASIC FORTRAN, or APL.	3
Electives	35
TOTAL MINIMUM LOWER DIVISION CREDITS	62

Students planning to transfer to the School of Landscape Architecture should consider the following as guidelines in selecting their 35 credit hours of electives. The subject areas are considered highly desirable but are not required. Course areas marked (*) are required following transfer to the School, but can be waived if completed prior to transferring. This will allow a student to take additional electives at ESF.

1. In addition to the required prerequisite credit hours listed, further subject coverage in Written and Oral Communications, Natural Sciences, and Social Sciences as listed above is recommended.
2. Art and Design
   Courses in this category should preferably include Art History* and Studio Art. Studio courses in Drawing or Three-Dimensional Design, i.e., Sculpture, Ceramics, etc., are recommended.
3. Analytical Tools
   Courses in this category should preferably include Elementary Plane Surveying*, or Air Photo Interpretation*.

Bachelor of Landscape Architecture Curriculum

Third Year

			Credit Hours
First Semester	LSA 320	Introduction to Landscape Architecture and Planning	3
	LSA 326	Landscape Architectural Design Studio I	3
	GRA 382	Graphic Communication	2
	EIN 311	Natural Processes in Planning and Design	3
	FBL 320	General Ecology or Elective	3
	APM 360	Introduction to Computer Programming or Elective	2
			16
Second Semester	LSA 327	Landscape Architecture Design Studio II	3
	LSA 330	Site Research and Analysis	2
	EIN 371	History of American Landscape Attitudes	3
	EIN 390	Social/Cultural Influences and Environmental Form	3
	ERE 306	Elements of Map and Air Photo Interpretation or Elective	1
	ERE 308	Elements of Plane Surveying or Elective	1
	LIB 300	Library Research	1
	ENG 406	Technical Writing	2
			16

NOTE: Prior to the required direct application to the B.S. or B.L.A. degree programs in 1983-84, students must select either the B.S. or B.L.A. degree option before the conclusion of the third year. This selection is made with a faculty advisor after a complete evaluation of the student's career goals and program opportunities.

Fourth Year

			Credit Hours
First Semester	LSA 422	Landscape Design Studio III	4
	LSA 433	Plant Materials	2
	LSA 434	Design Materials	1
	LSA 442	Site Grading	2
	LSA 443	Site Drainage Systems	1
	EIN 451	Fundamentals of City and Regional Planning	3
	EIN 471	History of Landscape Architecture	3
			16

			Credit Hours
Second Semester	LSA 423	Landscape Design Studio IV	4
	LSA 425	Orientation for Experiential Studio	3
	LSA 444	Vehicular Circulation Design	1
	LSA 445	Introduction to Structures	1
	LSA 455	Professional Practice in Landscape Architecture	2
	EIN 470	Art History or Elective	3
	Elective		3
			17

Fifth Year

			Credit Hours
Summer	LSA 533	Plant Materials	2
First Semester	LSA 524	Experiential Landscape Design Studio V (Off-Campus Program)	16
Second Semester	LSA 522	Landscape Design Studio VI—Urban Design	4
	or		
	LSA 525	Landscape Design Studio VI—Site Design	4
	or		
	LSA 527	Landscape Design Studio VI—Regional Design	4
	LSA 545	Professional Practice Studio	2
	Architecture Elective		3
	Elective		3
	Elective		3
			15

A total of 160 credit hours is required to complete the B.L.A. degree.

NOTE: A number of the courses listed in the B.L.A. curriculum are in the process of being revised. Upon revision, new course descriptions will be available after approval by the College of Environmental Science and Forestry Faculty.

GRADUATE PROGRAM

MASTER OF LANDSCAPE ARCHITECTURE

The master's degree is offered to those students who hold an undergraduate degree and meet the prerequisites for admission. The program's focus is community design and planning. The three-year course of study provides a strong foundation of design theory and process while emphasizing mastery of the skills associated with an area of specialization. The core curricula focuses on processes of community design and planning. Students are required to integrate the required core of coursework with an elected area of concentration in physical, cultural, or communications/participation arenas. The program requires cross-disciplinary study to prepare students to enter a variety of emerging positions in the public and private sectors. Illustration of these positions may be found in design research, community development, impact analysis, and environmental management. Although these positions require working knowledge of design, they transcend the traditional skills normally associated with project design. Processes related to management, analysis techniques, technological application, and the social and natural sciences are considered necessary to undertake these and other similar positions. Graduates of the program are currently employed by government, educational institutions and private offices practicing environmental design and analysis across a broad and comprehensive scope or purview. Many graduates have pursued full- or part-time careers in design education. The M.L.A. degree is granted upon the completion of 72 credit hours (42 graduate) in a prescribed curriculum.

A variety of joint degree program opportunities exists for applicants wishing to develop a unique career track. Dual professional degrees in Law or Business may simultaneously be pursued at Syracuse University. Ph.D. programs for careers in teaching and research are available within the College's Graduate Program in Environmental Science, and with a variety of programs at Syracuse University, such as geography. Applicants interested in dual degree programs are encouraged to contact the College's Graduate Admissions Office at an early date.

M.L.A. DEGREE PROGRAM

The M.L.A. curriculum has four components; a foundation year; a sequence of required core courses; a series of elected courses in an area of concentration; and a terminal experience. The foundation coursework provides the skill and knowledge basis for engaging environmental design. The required core courses have as their focus the development, enhancement, and refinement of understanding of landscape architectural philosophy, theory, skills, and techniques, as focused on community design and planning. Emphasis is placed on the refinement of proficiency in design analysis skills, concepts, and objectives.

Each student is required to select and complete a group of courses in an area of concentration in one of three design-related areas. These areas are cultural, physical, and communications/participation, as related to community environmental design. Selection of an area of concentration is the responsibility of each student assisted by a faculty advisor at the end of the first year.

Three terminal experience options are available: thesis or project, academic or professional experience. A project consists of the critical application of professional knowledge and skills to a landscape architectural problem in order to develop a solution. A thesis consists of research which expands or clarifies basic knowledge related to community environmental design. The coursework option involves selected electives in the designated area of concentration.

The following describes the broad sequential linkages of the six-semester program:

First Year: Foundation courses in design analysis, physical factors, graphics, history, and theory, and start of graduate elective sequence, or engagement of additional undergraduate technical subjects. The scale focus is human, site, and neighborhood.

Second Year, Fall Semester: The third semester of study is intended to provide an introduction to decision making processes, including computer simulations in emerging areas of community design and planning. An examination of the impact of physical factors on the environment is provided. Scale focus includes municipal and site.

Second Year, Spring Semester: The fourth semester of study is intended to investigate community design and planning through a variety of projects focusing on the form and condition of environments supporting human behavior. Methods of research and analysis relevant to social determinants are introduced. Scale focus is urban.

Third Year: This year is individually designed, with the assistance of a major professor, to meet the student's career objectives while satisfying the requirements of the selected concentration area, and terminal experience. Study and research opportunities exist both at the Syracuse Campus and throughout the world. Often, all or a portion of the fall semester involves off-campus pursuits, while the spring semester entails final coursework and project documentation.

Research and community service play a significant role in the graduate program, primarily through funded projects and projects/thesis. Not only does research provide new knowledge and applications for the profession, but it enriches the curriculum, enhances faculty expertise and develops student skills in rigorous observation, clear thinking and lucid writing.

By the nature of a profession which exists on evolving frontiers of human interaction with natural and built environments, much of the research in landscape architecture deals with issues in an exploratory way. Faculty members and graduate students usually work together on research projects in an atmosphere of mutual learning. Approaches may vary from rigorously quantitative analysis of data, to highly qualitative evaluation of broad problems, to application of design and planning methods to specific cases.

The College library and the several libraries on the Syracuse University campus offer reference material to support study programs. Facilities at the School are extensive. They include adequate studio and office space as well as reproduction, model making, photographic and audio-visual equipment. The College's Computer Center is fully interfaced with Syracuse University to provide a complete range of academic and research capabilities. The College also has a fully-equipped video tape recording (VTR) studio and photogrammetric labs.

The School is unique in its location within the College of Environmental Science and Forestry. This situation provides the M.L.A. candidate with the opportunity to draw upon information and knowledge in ecology, natural sciences, resource management, forestry and many other related environmental disciplines. The U.S. Forest Service Urban Forestry unit located at the College provides a unique opportunity to promote interdisciplinary environmental design research. In addition, the relationship with Syracuse

University provides the School with an extensive intellectual as well as physical resource basis.

The Syracuse area has the largest concentration of landscape architectural firms in the state, outside New York City. With a metropolitan population of nearly 500,000, the city has many opportunities for urban-oriented study. Also, the city's central location in Upstate New York provides easy access to a rich variety of community design and planning contexts throughout the northeastern U.S. and the major metropoli of Canada.

Students seeking admission to the M.L.A. program may apply to enter in either the first or second year based on education and experience. Admission to the first year requires:

1. An undergraduate degree.
2. Graduate Record Examination scores.
3. Undergraduate transcript.
4. Three letters of recommendation.
5. A completed course in each of three areas:
    a. botany, biology, or ecology;
    b. geology, geomorphology, or earth science;
    c. anthropology, psychology, or sociology.

In addition, students seeking admission to the second year must have:

6. Accredited design degree or equivalent;
7. Design and engineering portfolio;
8. TOEFL scores required for all applicants whose native language is not English. Applications should be made prior to March 1 for the following fall.

M.L.A. Program Sequence

The M.L.A. program is established as a three-year sequence of courses. The following sequence illustrates a typical three-year program.

First Year		Credit Hours
LSA 520	Design Analysis Studio I	3
LSA 382	Graphic Communication	2
LSA 671	History of Landscape Architecture	3
[1]LSA 697	Topics and Issues of CDP	2
LSA 521	Design Analysis Studio II	3
LSA 330	Site Analysis	2
ERE 306	Air Photo Interpretation	1
LSA 445	Structures	1
LSA 496	Site Grading	1
[2]Directed Electives		6
		24

Second Year

		Credit Hours
LSA 620	Community Design and Planning Studio I	4
LSA 696	Community Development Process	3
LSA 656	Environmental Factors, Community Response, and Form	3
[3]LSA 433	Plant Materials	2
[3]LSA 434	Design Materials	1
LSA 621	Community Design and Planning Studio II	4
LSA 650	Behavioral Factors of Community Design	3
Directed Electives		4
		24

Third Year

[4]Typical Options for Integrative Experience

	Thesis/Project		Academic/ Professional Experience		Coursework	
	Fall	Spring	Fall	Spring	Fall	Spring
LSA 898 Academic/Professional			12			
LSA 899 Thesis/Project	3	6				
LSA 641 Formal Organization		1		1		1
LSA 642 Project and Program Scheduling		1		1		1
LSA 643 Ethical Issues in Community Design and Planning		1		1		1
Directed Electives	9	3		9	12	9
	12	12	12	12	12	12

NOTES:

1. Also required for students who enter with advanced standing.
2. Directed electives are selected in consultation with the student's advisor. They are designed to augment the student's undergraduate preparation, to develop the required concentration, and to fulfill the requirement for a computer or statistics course.
3. Usually not required for students who enter with advanced standing.
4. The precise number of credit hours taken by a student during a given semester in LSA 899, LSA 898, or in directed electives is determined in consultation with the student's advisor.

DUAL UNDERGRADUATE PROGRAM IN ENVIRONMENTAL AND FOREST BIOLOGY AND RESOURCES MANAGEMENT

This dual curriculum is designed to provide students with a strong background in basic biology and forestry. In doing so it meets the core course requirements in two undergraduate curricula: Environmental and Forest Biology, and Resources Management. The Dual Program is one level in a continuum of Biology and Forestry study opportunities at the College:

Environmental and Forest Biology
Environmental and Forest Biology with Forestry Electives
Dual Program
Resources Management with Biology Electives
Resources Management

Upon completion of the Dual Program, graduates will be highly qualified to work professionally in forested ecosystems. The breadth of training received by students who elect this option will prepare them for a career in forestry and other aspects of environmental science in the federal, state, and private sectors. Exposure to diverse courses and extensive field experience enhances their employment opportunities in multidisciplinary programs that are characteristic of contemporary approaches to forestry management and other environmental problems.

The Dual Program requires a minimum of five semesters at the upper division level. Six semesters may be necessary for those students who lack appropriate lower division courses, or who wish to develop specific interests in forest biology or forestry. A total of 147 credit hours, 62 of them prior to matriculation, is required for this Bachelor of Science degree. In addition to the 58 credit hours of upper division core courses listed below, six of the elective credit hours must be in courses designated FBO (Plant Science), six in FEN or FZO (Animal Science), six in FOR (Forestry) and three in WPE (Wood Products Engineering) or FEB (Forest Engineering), exclusive of the six-hour summer camp experience.

There is less opportunity to take free electives in the Dual Program than in the two curricula which it combines. It is recommended that elective requirements in plant science and animal science address critical support areas such as forest pathology, plant ecology, fish and wildlife management, and forest entomology. Similarly, forestry electives in silviculture, hydrology, or tree improvement are examples of elective opportunities in important forestry support areas. In all cases, choice of electives depends on the student's professional goals. Course selection is made after consultation with each of two advisors; one from the School of Environmental and Forest Biology and one from the School of Forestry.

To facilitate transfer at the junior level, it is important that students satisfy the lower division course requirements prior to matriculation at the College of Environmental Science and Forestry.

Students entering at the junior level should have successfully completed a minimum of 62 credits which include:

Lower Division Courses

Course Area	*Credit Hours*
General Chemistry with Laboratory	8
Organic Chemistry with Laboratory	8
General Physics with Laboratory	8
Mathematics, through Integral Calculus	6-8
English	6
General Botany and Zoology OR General Biology with Laboratory	8
*Social Sciences	6
*Political Science (U.S. Institutions)	6
*Biology Electives OR Economics (Macro- and Microeconomics)	6
	62

Upper Division Courses

Junior Level			*Credit Hours*
Fall Semester	FBO 315	Dendrology	3
	FBL 320	General Ecology	3
	**FEN 350	Entomology	3
	***FOR 205	Microeconomics	3
	****Elective		3
			15
Spring Semester	ABM 391	Statistics	3
	FBL 330	Physiology	3
	FOR 360	Principles of Management	3
	****Elective		3
	**FOR 206	Macroeconomics	3
	Computer Application		1
			16
Summer:	FOR 300	Field Forestry Program at Warrensburg	6
Fall Semester	FOR 331	Introduction to Physical Environment	6
	FOR 332	Silvics/Silviculture	8
	FOR 322	Mensuration	3
			17

Senior Level			*Credit Hours*
Spring Semester	FOR 370	Management of Forest Enterprise	3
	FBL 470	Genetics	3
	FBL 471	Genetics Laboratory	1
	****Electives		9
			16

			Credit Hours
Fall Semester	APM 492	Biometrics	3
	FOR 400	Social Environment of Resource Management	3
	FOR 461	Management Models	3
	****Electives		6
			15

*Students may be admitted with 3 credit hours in each of these subject areas. Deficiencies must be removed as early as possible in the student's program.

**A spring course, FEN 300, may be substituted if scheduling problems conflict with FEN 350. This will open up 3 hours of electives during the fall semester rather than in the spring.

***If the economics requirement is satisfied in the freshman and sophomore years, biology or forestry electives may be substituted and vice versa.

****These electives should include at least 3 credits in WPE or FEB, 6 credits in FOR, 6 credits in plant sciences, and 6 credits in animal science.

COLLEGE-WIDE PROGRAM IN ENVIRONMENTAL SCIENCE

ROBERT D. HENNIGAN, *Director* (Environmental Management, Policy and Programming, Water Quality and Urban Water Management), ALEXANDER (Wildlife Biology, Wetland Ecology), BENNETT (Forestry Economics), BLACK (Watershed Hydrology, Water Quality), BROCK (Analytic and Interpretative Photogrammetry, Remote Sensing), CANHAM (Resource and Land Use Economics, Regional Planning), CHAMBERS (Wildlife Ecology and Management), COCHRAN (Communications), CUNIA (Operations Research, Statistics, Mensuration), DALL (Legal and Institutional Arrangements for Management of Natural Resources and Environmental Protection, Environmental Policy), DENCE (Organic Chemistry and Lignin Reactions), DINDAL (Soil and Microcommunity Ecology), DUGGIN, ESCHNER (Watershed Hydrology, Snow Hydrology), FELLEMAN (Site Engineering, Environmental Land Use Planning), FREY (Public Policy Analysis, Organization Theory), GEIS (Plant Community Dynamics, Plant-Soil Relationships), GRATZER (Recreation Resource Management and Planning), GRAVES (Resources and Environmental Management, Policy Analysis), HANNA (Transmission Electron Microscopy, Cellular Ultrastructure), HANSELMAN (Education and Communications Strategies, Learning Simulations), HARPER (Regional Resources Analysis, Scenic Assessment), HAWKS (Landscape Architecture, Regional Planning and Design, Facility Siting and Routing), HOLTMAN (Educational Communications, Message Design, Applied Communications), HORN (Legal and Business Aspects of Resources Management and Policy), JELINEK (Computer Applications, Process Design), JOHNSON (Speciation of Heavy Metals in Air, Water and Other Materials), KETCHLEDGE (Plant Science, Ecology, Bryology), LEE (Systems Engineering Computers, Soil Mechanics), LEWIS (City and Regional Planning, Systems Dynamics), LUNER (Mechanical and Surface Properties of Fibers, Films and Paper), MARAVIGLIA (Creative Problem Solving, Management), MARK (Properties of Woods and Fibers, Solid Mechanics of Cell Walls), MCCLIMANS (Soil and Water Conservation, Mechanization, Energy Systems), MEYER (Wood Polymers, Radiation Chemistry), MEYER, R. (Wood Properties and Utilization), MITCHELL (Decomposition Processes, Flora-Faunal Interactions), MORRISON (Psychology, Sociology, Environmental Policy), NAKAS (Nutrient Cycling and Decomposition of Microorganisms, Soil and Aquatic Microbiology), NAKATSUGAWA (Detoxification Mechanisms, Health Effects of Pesticides, Pollutants), PALMER (Biomass Energy Systems; Engineering Economics), PAYNE (Wildlife Conservation, Nature Interpretation), PORTER (Nature Interpretation, Wildlife Habitat Research), RAYNAL (Plant Populations, Community Ecology), RINGLER (Environmental Biology of Fishes, Stream Ecology), SMARDON (Landscape Design, Environmental Impact Analysis, Environmental Planning), SMITH (Physical and Polymer Chemistry), TULLY (Computer Modeling of Stormwater Runoff, Relationships between Hydrologic Models and Water Resources Decisions), TURAI (Water and Air Pollution Abatement Engineering, Materials Science and Engineering), VAN DRUFF (Urban Wildlife, Wetland and Waterfowl Biology), WEBSTER (Research Methods, Environmental Education and Communications), WERNER (Limnology, Fish Ecology).

Adjunct Faculty

ALEXANDER, DURKIN, ELY, ROBERTSON, ROWNTREE, SANDERS, THOMPSON, WEEKS.

A PERSPECTIVE

Environmental science is the study of people and their relationships with the environment. The environment is the physical, chemical, biological, and social setting in which people live, work, and play. Consequently, environmental science is concerned with the natural setting, the culture imposed by man in this setting, and the institutional system man has devised to order the relationships between many conflicting demands and desires in light of natural and social constraints. Few, if any, locations on this earth are totally independent; external dependencies and impacts exist, to a greater or lesser degree, and must be factored into this environmental matrix.

Environmental science connotes a holistic orientation, one that recognizes interdependence and interrelatedness of all the social and technical facets of the environment, as opposed to an atomistic orientation which treats these facets as fragmented and unrelated. Armed with this perspective, it is apparent that the environmental problems facing society today are a product of human interaction with the environment, not simply a number of technological difficulties.

Present day interest and concern with environmental matters had as its antecedents the separate development of conservation and public health programs in the 1880s which had a rather narrow focus. These concerns became progressively broader under the press of social and technological growth in the 40s, 50s, and 60s. A new environmental movement then emerged outside of these traditional approaches culminating in Earth Day, 1970.

This environmental movement enlisted a constituency outside of the conservation and public health traditions and agencies. Conservation and public health elements were combined in a unified approach. The resource focus of conservation and the people focus of public health became merged into the single focus of people and resources. The goal is to maintain acceptable environmental conditions, while simultaneously providing for the effective utilization of resources.

In order to meet the demands for a broader integrative approach to environmental affairs, a number of new statutes were passed, epitomized by the National Environmental Policy Act; new agencies were formed, old agencies were reorganized. The new participants included citizen activists, lawyers, natural scientists, and planners in unprecedented numbers to add to the cadre of professionals and citizen activists from the public health and conservation traditions. One major result of this was the realization that the environment must be viewed holistically, and that there were two major aspects to all environmental issues, the technical-scientific, and the political-social. This requires that all students of environmental science fully understand and comprehend both of these components of environmental affairs.

THE PROGRAM

The Graduate Program in Environmental Science (GPES) resulted from the realization that there is a need to provide an opportunity for interdepartmental and interdisciplinary study. Consequently, the faculty for the program is drawn from the faculty of the existing schools and departments.

Other important inputs to this program are the resources of Syracuse University in the coursework areas of communications, policy, law, engineering, science, sociology and political science, and the community and institutional resources of the region such as federal, state, and local agencies, faculties of other colleges, and private organizations.

PROGRAM OBJECTIVES

The GPES is designed to prepare graduate students for careers in environmental affairs. This includes working in such diverse areas as teaching and research, communications, planning, regulatory administration, general administration, policy and program analysis. The emphasis can be technical-scientific or institutional-social with varying blends of the two.

Students enter directly from undergraduate schools or, as is increasingly happening, after some years of professional experience. The goals of the entering students vary considerably, such as development of needed career skills and expertise, career changes, adding breadth to a technical background, adding depth to a general background, and mid-career updating.

AREAS OF STUDY

Public policy and programming is a major study area which integrates all aspects of environmental science.

The areas of concentration, in addition to policy, now being offered under the GPES are environmental education/communication, environmental assessment and impact analysis, environmental land use planning, water resources, and energy conservation and development. These areas are not exclusionary. It may well be that a student will desire a program that does not fall into the listed categories. This need can be met providing that the faculty resources are available in the College and associated institutions. Students with a desire for a highly individualized program falling within the scope of the College's offerings are encouraged to make application for admission.

Students with an undergraduate major in engineering, science, mathematics, political science, economics, journalism, public communications, or forestry would be best prepared to undertake a graduate program in environmental science. All applicants must meet the general admission requirements of ESF. Each applicant is evaluated on an individual basis, and judgment is exercised if the student appears to be deficient in some aspects. Considerations include years of experience, maturity, and motivation. Potential applicants should not hesitate to submit applications for consideration. All applicants are urged to visit the campus and confer with appropriate faculty and administrative personnel.

REQUIREMENTS

Program requirements are designed on a highly individual basis. The purpose is to design a program that fits the students' particular needs, goals, and preparation. Each program must meet the need for *depth* in a particular area, *breadth* across the environmental spectrum, and *synthesis* of information and analysis in evaluating environmental situations. Program evaluation is based on undergraduate work and experience, as well as courses taken at the College. The program must also be coherent, logical, and result in a meaningful whole. Current areas of study are:

Environmental Policy

GPES is the policy center for the College. As such, it is involved and concerned with the public policy and programming aspects of the entire spectrum of environmental conservation and protection. Consequently, policy study is the integrating force bringing all concentration study areas together in pursuit of the common goal of meaningful and effective research and education in environmental science.

Environmental policy studies prepares individuals for leadership positions in the formulation and execution of public policy and the implementation of programs related to Environmental Conservation and Protection. Studies deal mainly with the decision processes of governmental systems including public involvement and provide integrated knowledge of environmental science and the evaluative techniques of economics, political science, public administration and law.

Environmental Education/Communication

The Environmental Education/Communication area of study is concerned with those facets of environmental protection, enhancement, management, and design in which the flow of information and the processes of education are integral to end results. The basic emphasis is to integrate a solid and substantial background in environmental science with a mastery of appropriate education and communications theory and practice in such a manner as to prepare students in the program for careers in environmental education and communications.

Although closely related, there are several rather distinct career areas under the umbrella of EE/C for which this program unit provides preparatory graduate degree training. These career areas can be generally categorized as follows: Public Information Officer, Environmental Education Specialist, Extension Specialist, Interpretive Naturalist, Environmental Journalist.

Water Resources

The Water Resources area of study is based on the recognition that water relationships are important in almost every aspect of human concern and merit attention as integrative and central elements rather than accessories.

The thrust of the program is either technical or social depending on student interest. The technical aspect is concerned with water quality and quantity relationships, their quantifications and determinants. The social aspect is concerned with planning, regulation, law and institutions, and management. National concern with water resources planning, water supply, and water pollution control attest to the need for people trained in these areas.

Environmental Assessment and Impact Analysis

The main objective of this area of study is to bring together, in an organized educational unit, the various skills and disciplines required for an environmental impact analysis. In practice, such an analysis is a team effort, and the program is intended to ensure that potential team members are conversant with, and operationally adapted to, the language and procedures of a number of the disciplines involved. Starting with students who have an in-depth background in a traditional (i.e., chemistry, biology, engineering, ecology, forestry, et al.) discipline, the program seeks to refine existing strengths while at the same time broadening the students' ability to deal effectively with the complex, interdisciplinary problems which arise in studies of environmental impact. To ensure the depth and breadth aspects simultaneously, the academic plan stresses a problem-oriented team research approach.

Environmental Land Use Planning

The land use planning area of study is based on the concept that land use is a fundamental determinant of environmental conditions, be it water pollution, air pollution, population density, solid waste disposal, or other impacts. The program is designed to acquaint the student with the physical elements of land use such as location and natural resources, and the social side relating to law, economics, and regulation. Land use management and control is fast becoming the major environmental issue of the day. Land use planners and implementors are sorely needed on a local and regional level. This program unit proposes to meet that need.

Energy Conservation and Development

The energy concentration provides a framework within which a student can study energy-environment-economy relationships with a focus on renewable resource alternatives to social energy resource requirements. Because of the interdisciplinary nature of the subject, opportunities are available for a wide variety of academic studies which combine and integrate physical and social considerations.

Additional Area

This is not a specific area of study but a program element to provide for the highly individual program designed to meet a particular student's needs. Special provisions may be made for a study concentration not listed. The emphasis can be on any appropriate subject within the resources of the College and related institutions.

THE STUDENT

A major advisor is assigned by the program director to accept primary responsibility for the program of each student. Two additional faculty members in areas of expected academic or research emphasis are also selected. These three faculty members constitute the academic program committee for the student. The student is required to submit a formal proposal to the committee consisting of a detailed plan describing and defending the academics and research objectives of the program and a schedule of courses to be taken. The plan is reviewed and updated at the beginning of each semester. The program committee also serves as the thesis or project committee.

The program operates within the College-wide requirements for graduate students. All students in the program are required to participate in the environmental science seminar which brings together a variety of lecturers with a wide spectrum of interest. Communication, and a campus visit and an interview are highly recommended prior to or during the application process.

THE SCHOOL OF FOREST TECHNOLOGY

JAMES E. COUFAL, *Director* (Silviculture, Forest Management, Pathology, and Personnel Management)

LUNK (Wildlife Ecology, Graphics, Entomology, Silviculture, and Recreation), MARTIN (Mensuration, Statistics, Wildlife Ecology, Tree Physiology and Morphology), MILLER (Forest Roads, Installations, Recreation, and Policy), REMELE (Ecology, Silvics and Silviculture, Forest Management, and Aerial Photogrammetry), STERBENZ (Surveying, Graphics, Computer Science, and Remote Sensing), SUHR (Water Resource Management, Dendrology, Entomology, and Aerial Photogrammetry).

FOREST TECHNICIAN PROGRAM

In 1912, some 1,800 acres of land in the Adirondack Mountains were donated to the College as a site for the development of a Ranger School. Since that time, the forest technician program has trained over 3,000 graduates, most of whom are now working in a variety of forest activities, and it has earned the School a national reputation for excellence.

The two-year curriculum trains students as forest technicians. The degree of Associate of Applied Science in Forest Technology (A.A.S.) is awarded. The objectives of the curriculum are to provide students with a knowledge of the field practices of forestry as related to forestry managerial needs; the ability to work and communicate effectively with professional and paraprofessional forestry personnel; and an understanding of the sciences and practices of forestry with some emphasis on ecological applications.

Graduates are generally classified as forest technicians or forestry aides in initial employment positions. Forestry agencies and wood-using industries employ forest technicians as an important part of their forest management teams, usually as the “people on the ground” who plan and execute the field practice of forestry normally under the supervision of a professional forester.

Since the curriculum is a terminal, two-year program at the paraprofessional level, students interested in a professional degree in forestry should investigate enrollment directly in one of the College’s undergraduate programs. Transfer into some of these programs is possible upon completion of the A.A.S. degree.

If a student feels transfer to a baccalaureate program is a possibility after graduation from the School of Forest Technology, he or she should pay close attention to the footnotes under “Freshman Year” on page 129.

The freshman year forest technology curriculum consists of general studies courses which may be taken at any accredited four-year college, community or junior college, or agricultural and technical institute except Farmingdale or Alfred (although transfer credits from these schools are acceptable otherwise).

The second year of the curriculum is offered at the College's School of Forest Technology on the Wanakena Campus. Presented in a varied forest environment, the curriculum's emphasis is on fundamental forestry knowledge and applied field training as well as the relationships between forest technology and managerial needs. Fifty percent of the studies are devoted to field exercises, most of which are held in the School's forest. This managed forest, containing both hardwood and coniferous species, covers an area some 3½ miles long with widths varying up to 2¼ miles. On two sides, the forest is bounded by State Forest Preserve lands. The forest is also adjacent to several square miles of virgin timber within the Adirondack Forest Preserve. This excellent forest backdrop for the technology program provides a diverse laboratory for instructional purposes.

Since the School is situated within a forest environment, some applicants to the forest technology program may mistakenly believe that the program is one of forest lore and wilderness survival. It is, therefore, strongly emphasized that the forest technology curriculum demands high quality academic achievement. Students cannot complete the program without concentrated and consistent study. Classes are scheduled from 8 a.m. to 5 p.m., Monday through Friday, with classroom and laboratory or field time equally divided. The intensity of the program normally requires a minimum of 70 hours a week of evening and weekend study, daily classes, and laboratory/field exercises. Several short trips, at no additional expense to the student, are made during the year in connection with courses in logging, forest recreation, forest mensuration and silviculture, but especially during the general forestry course.

LIFE AT WANAKENA

The Wanakena Campus of the College of Environmental Science and Forestry is located on the banks of the Oswegatchie River near the picturesque hamlet of Wanakena, approximately 65 miles northeast of Watertown, and 35 miles west of Tupper Lake. The School's buildings and its surrounding forest border on the river which flows directly into Cranberry Lake.

The main School building consists of a central service unit with dormitory wings on either side. The central unit contains classrooms, laboratories, a student lounge, faculty offices, the library, a kitchen, dining room and 47 student rooms, each housing two students.

Faculty houses are nearby on the campus. Other buildings include a maintenance shop, garages, a sugar house, and storage buildings.

The close proximity of faculty offices and student quarters and the intensive field-work pattern enables students to consult easily and frequently with the faculty. The School considers this traditional close student-faculty association to be of major benefit in its training program.

A small library of approximately 1,500 volumes consists of highly specialized materials required for the teaching and study programs of the School.

Students taking the second year of the forest technology curriculum at the Wanakena Campus are required to live in the School's dormitories. An exception may be made for married students who bring their families and rent their own private accommodations in the vicinity. Such accommodations are not plentiful. Each married student should make rental arrangements well in advance of the registration date.

The Wanakena Campus does not maintain an infirmary, nor does it employ a physician or nurse. There are four excellent physicians and a dentist as well as an excellent Community Hospital in nearby Star Lake, New York. In emergency situations, the School transports sick or injured students to the local physician of their choice or to the hospital. A student accident or sickness insurance plan is available through the Wanakena Campus, and it is strongly suggested that the student consider such coverage before reporting to the Campus.

Because of the comparatively isolated location of the Wanakena Campus, a stock of books and supplies used in connection with the second year of the program is maintained on campus for sale to students.

During the first year of the program, College-enrolled students will be guided by the rules and regulations that govern attendance at their local campus. During the second year of the program, students will be guided by the general rules and regulations for College of Environmental Science and Forestry students and an additional set of Wanakena Campus "house rules."

ADMISSION

Admission Requirements

Requirements for entrance into the forest technology curriculum require a minimum of high school units consisting of: English; history (social science); science (including biology); mathematics (including trigonometry or Math 11); and electives. Mechanical drawing is a suggested elective.

In addition to the academic requirements, the following must also be met by all applicants:

1. The applicant must be strongly motivated toward a career as a forest technician.
2. The applicant must be willing and able to meet the physical requirements of the program which include pole and tree climbing, walking 2 to 6 miles through forest areas often carrying 15-20 pounds of equipment, and using a wide array of hand tools and power equipment.

3. The applicant's parents (if the applicant is under 18 years of age) must be fully aware of the field nature of the study program, its rigorous study-work regime and supporting academic facilities.
4. A full medical examination report must be submitted.

Questions concerning any of these requirements should be referred to the Director of Admissions who may, under special circumstances, waive some of them.

Admission Procedures

The decision to admit any student to the Forest Technician Program rests solely with the College of Environmental Science and Forestry. Most openings in the program are filled by students who received conditional acceptances while still seniors in high school, contingent on successful completion of the first year of college. Remaining openings are filled by transfer students who have already attended college. Therefore, it is suggested that the potential forest technician student apply while still a high school senior.

Here is the procedure:

1. Seniors in high school must submit a regular SUNY freshman application for the College of Environmental Science and Forestry, using a Curriculum Code 620 (Forest Technology). These applicants should indicate entry date to be one year in advance of the current year.
2. Submit a regular application to that school selected for the first year of study, using Curriculum Code 620. It is important that students gain entry on their own for the first year of studies. The College will request information at a later date concerning what institution the student will be attending.

Transfer Students

Students with previous college experience, or students who are currently enrolled at another college, may apply for transfer. However, courses transferred for credit can be applied only to the freshman year course of studies, and they must be appropriate to those courses and comparable in subject matter, content, and level. All second year courses must be taken at the Wanakena Campus and, therefore, a student cannot transfer any previously earned credit toward the second year. Transfer applicants must submit a recent official copy of their college transcript and a list of courses they anticipate completing prior to enrollment.

EXPENSES

Cost of the first year will vary with the specific institution attended.

Estimated costs of the second-year program on the Wanakena Campus are as follows:

	Tuition	*Board & Room*	*Books & Supplies*
New York Resident	$1,050	Approx. $1,908	Approx. $375
Nonresident	$1,650	Approx. $1,908	Approx. $375

An additional estimated expense of $200 will likely be incurred to cover the cost of laundry and clothing. There is also a $20 graduation fee and a $10 student activity fee, plus a $50 residence deposit and a $25 equipment deposit. The latter two fees are fully or partially refundable, depending on breakage charged to a student during the year.

FOREST TECHNOLOGY CURRICULUM
(Associate of Applied Science Degree)

Freshman Year	*Credit Hours*
(*Completed at a college of the student's choice*)	
[1]General Biology	8
English	6
[2]Math	6
Economics	3
[3]Electives	7
	30

[1]Courses selected may be in general biology, but at least one course in introductory botany is preferred.

[2]Competency in plane trigonometry and college algebra is required. If demonstrated, credits become electives. If a student feels transfer to a baccalaureate program is a possibility, he would be well advised to take calculus.

[3]If a student feels transfer to a baccalaureate program is a possibility, general chemistry and physics should be taken as electives. Otherwise, courses in sociology, psychology, political science, geology, accounting, business, etc. are desirable electives.

Senior Year (Wanakena Campus) — *Credit Hours*

First Semester	FTC 200	Dendrology I	2
	FTC 202	Plane Surveying I	4
	FTC 204	Forest Mensuration and Statistics I	3½
	FTC 206	Forest Ecology	3
	FTC 207	Aerial Photogrammetry	2
	FTC 208	Forest Installations	3
	FTC 213	Forest Protection I	2
	FTC 223	Graphics	1
			20½

			Credit Hours
Second Semester	FTC 203	Plane Surveying II	1
	FTC 205	Forest Mensuration and Statistics II	2
	FTC 209	Forest Roads	2
	FTC 211	Silviculture	2½
	FTC 212	General Forestry	1½
	FTC 214	Personnel Management	1½
	FTC 215	Timber Harvesting	2
	FTC 217	Forest Management	2½
	FTC 218	Forest Recreation	1½
	FTC 219	Elements of Wildlife Ecology	1½
	FTC 221	Water Resource Management	2
	FTC 227	Forest Protection II	2
	FTC 228	Structure and Growth of Trees	1½
	FTC 229	Silviculture II	
		or	2
	FTC 230	Plane Surveying III	
			25½

A total of 76 credit hours is required. Upon satisfactory completion, an Associate of Applied Science (A.A.S.) degree in Forest Technology will be awarded.

FINANCIAL ASSISTANCE

Financial aid is available upon acceptance to the College of Environmental Science and Forestry. There are three basic loans, scholarships or grants, and part-time employment.

More detailed information on these financial aid opportunities can be found on pages 32-36 of this catalog and the publication *Financial Assistance at ESF.*

The student must file an application with the Office of Financial Aid at the Syracuse Campus and submit a *Financial Aid Form* to the College Scholarship Service, Princeton, New Jersey 08540.

PLACEMENT

The School assists in placement of graduates. The reputation of the College's Forest Technology School usually results in graduates being readily able to find employment. Employment is common with local, state and federal forestry, and land resource agencies, private forestry enterprises, and surveying firms. Positions most frequently filled by recent graduates include: state forest ranger, state forest technician, forest aid, industrial forest district supervisor, timber inventory specialist, timber sales supervisor, forest surveyor, forest engineering aid, forest protection technician, forest research technician, forest equipment salesman, tree service technician and urban park ranger.

Graduate Exchange Programs

INTERCAMPUS DOCTORAL EXCHANGE

There is an opportunity for doctoral students at ESF to study for one or two semesters at the following schools: State University Centers at Albany, Binghamton, Buffalo, or Stony Brook; City University of New York; or New York University.

This exchange program provides students with an opportunity to take advantage of over 160 faculty, specialized research laboratories and equipment, technical libraries, and field study areas which complement the extensive programs and resources at ESF which are discussed throughout this catalog.

This fellowship provides a grant-in-aid of up to $5,000 a year plus a tuition waiver. For further information, please contact the Office of Academic Programs.

COLLEGE OF AGRICULTURE AND LIFE SCIENCES AT CORNELL UNIVERSITY

The State University of New York College of Environmental Science and Forestry and the New York State College of Agriculture and Life Sciences at Cornell University provide an opportunity to exchange graduate students so they can take advantage of special courses, faculty, and research facilities.

There are a number of programs on both campuses which complement one another. The following research and instructional areas at the College of Agriculture and Life Sciences appear likely to be of greatest interest to ESF students:

Agricultural Economics—Land Economics; Resource Economics; Resource Investment and Environmental Quality; Agricultural Land Policy.

Agricultural Engineering—Physical Analysis of Plant and Animal Materials; Soil and Water Engineering; Environmental Systems Analysis; Drainage Engineering; Soil and Water Conservation.

Agronomy—Identification, Appraisal and Geography of Soils; Soil Fertility Management; Soil and Water Conservation; Aquatic Plant Management; Forest Soils; Soil Microbiology; Microbial Ecology; Use of Soil Information and Maps as Resource Inventories; Soil Organic Matter; Soil Chemistry; Weed Science; Dynamic Climatology; Physics of Clouds, Rain, and Rainmaking.

Natural Resources—Wildlife and Fisheries Management; Environmental Conservation; Resource Analysis and Planning; Woodland Management; Forest Ecology; Maple Syrup Production.

Floriculture—Woody Plant Materials; Herbaceous Plant Materials; Plants and Design.

Entomology—Insect Pest Management; Arthropod Pests of World Importance; Biological Control; Insect Pathology; Environmental Biology; Pesticides in the Environment.

Plant Breeding and Pathology—Plant Cell Genetics; Methods of Plant Breeding; Genetics and Breeding for Disease and Insect Resistance; Plant Pathology; Advanced Disease Control; Dendropathology; Pest Management for Plant Protection; Advanced Mycology; Plant Virology; Plant Nematology; Bacterial Plant Pathogens; Disease Physiology; Philosophy of Plant Pathology; Taxonomy of Fungi; Pathology of Trees and Shrubs.

Pomology—Tree Fruits; Orchard Management; Growth and Development of Woody Plants.

Rural Sociology—Rural Development and Cultural Change; Political Structure and Development; Social Power and Community Change; Political Economy of Rural and Regional Development.

For detailed information please contact the Office of Academic Programs.

Course Offerings

Students at the College of Environmental Science and Forestry have not only the academic and research resources of their own institution, but also the resources of nearby Syracuse University and State University Upstate Medical Center.

COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY COURSE DESCRIPTIONS

The courses offered by the College are grouped by general subject areas, and the number of credit hours appears after the course title. A credit hour means one recitation (or lecture) hour per week. Three laboratory hours are equivalent to one lecture hour.

The semester and year after each course indicates when it will next be offered. The College reserves the right to alter the scheduled offering of a course when its enrollment is too small, or when there is no qualified faculty member available to teach it.

Courses listed in this catalog are subject to change through normal academic channels. New courses, course deletions, and changes in courses are initiated by the cognizant departments or programs, approved by the appropriate academic dean, faculty committee, and the college faculty.

Course Numbering System

Code Levels:

100-299 Lower-division undergraduate courses for which no graduate credit may be given.

300-499 Upper-division undergraduate courses for which no graduate credit may be given.

500-599 Graduate courses designed expressly for areas of specialization in post-baccalaureate programs or in the professional program leading to the Bachelor of Landscape Architecture. Undergraduate students with superior academic records may register for these courses.

600-699 Graduate courses which permit undergraduate students to enroll only by petition with a well-documented justification approved by the undergraduate advisor, curriculum director, and course instructor.

700-999 Graduate courses for which no undergraduate may enroll.

General Subject Areas

APM—Applied Mathematics 134
EIN—Environmental Influences (Landscape Architecture) 135
ENS—Environmental Science 136
ERE—Engineering (Environmental and Resource Engineering) 137
EST—Environmental Studies 143
FBL—Biology (Forest Biology) 144
FBO—Botany (Forest Botany and Pathology) 146
FCH—Chemistry 150
FEG—Forest Engineering 155
FEN—Entomology (Forest Entomology) 157
FOR—Forestry (Resources Management) 159
FTC—Forest Technology 164
FZO—Zoology (Forest Zoology) 167
GRA—Graphics (Landscape Architecture) 170
LIB—Library (College of Environmental Science and Forestry Course) 171
LSA—Landscape Architecture 171
PSE—Paper Science and Engineering . 177
RMP—Resource Management and Policy 179
SCE—School of Continuing Education 181
SIL—Silviculture 182
WPE—Wood Products Engineering ... 184

APM—APPLIED MATHEMATICS

360. Introduction to Computer Programming (3)
The basic course in computer use offered by the College. It is intended to provide the student with the skill and understanding needed to utilize digital computer languages for problem solving. The course will cover instruction in APL, FORTRAN IV, use of operating systems, and some background material in general hardware/software designs. Fall and Spring, 1981-82.

391. Introduction to Probability and Statistics (3)
Two hours of lecture, three hours of laboratory. Elementary probability, theoretical and sampling distributions, hypothesis testing, statistical estimation, analysis of variance, regression and correlation, nonparametrics and sampling concepts. Fall and Spring, 1981-82.
Prerequisite: Two semesters of calculus.

492. Forest Biometrics (3)
Two hours of lecture, three hours of laboratory. Analysis of variance including nested and cross-classification. Matrix approach to multiple linear regression and weighted least squares. Nonlinear regression. Sampling methods and design. Applications to forestry problems. Fall, 1981.
Prerequisite: APM 391 or equivalent.

500. Introduction to Computer Programming for Graduate Students (3)
A basic course in computer usage. Provides the skill needed to utilize digital computer languages for problem solving. Includes a study of FORTRAN IV and APLwith a discussion of an Assembly Language. Other topics include representation of information, management of files, error control, operational systems and job control. Fall and Spring, 1981-82.

510. Statistical Analysis (3)
Two hours of lecture and three hours of laboratory. A treatment of statistical inference, including paired design, group design, linear regression and correlation, one way analysis of variance and some applications of chi-square. Calculation of statistics, test of hypotheses and proper interpretation of calculated statistics. Fall, 1981.

605. Theory of Probability Distributions (1-3)
Three hours of weekly sessions over five to 14 weeks. Statistical problems and mathematical models; random experiments, random variables, probability, frequency and distribution functions of discrete, continuous and mixed random variables; functions of random variables and the probability distributions; mathematical expectation and its applications; discussion of the main theoretical distributions such as binomial, Poisson, negative binomial, normal, Gamma, Beta, exponential and others; applications of this framework to the model construction problem in the statistical, operations research and forest mensuration areas. Fall or Spring, 1981-82.
Prerequisites: Two semesters of differential and integral calculus and an introductory course in statistics, or permission of the instructor. The course can be taken in conjunction with APM 651—Operations Research I (for one credit hour) or independent of it for one to three credit hours.

620. Analysis of Variance (3)
Three hours of lecture and recitation and three hours of laboratory. Multiway classifications in the analysis of variance, with emphasis on the development of models, including randomized blocks, latin squares, split plots, and factorial designs with fixed effects, random effects, and mixed effects; multiple and partial regression and correlation (including curvilinear), using matrix methods; analysis of covariance. Fall, 1981.
Prerequisites: Graduate standing and an introductory course in statistics covering material through the one-way analysis of variance.

625. Introduction to Sampling Techniques (3)
Two hours of lecture and three hours of laboratory. Introduction to the scientific basis of sampling: selecting an appropriate sampling unit; choosing an efficient design; calculating sampling error; determining a sample size to meet stated objectives. Spring, 1982.
Prerequisite: APM 391 or equivalent.

630. Regression Techniques with Applications to Forestry **(3)**
Two one and one-half hours of lecture. Review of matrix algebra, probability theory and statistical methods. Basic concepts in regression analysis. Classical linear regression model. Least and weighted least squares method. Dummy variables and their uses in regression and covariance analysis. Applications to problems of statistical prediction and estimation from the field of forestry in general and forest mensuration and inventory in particular. Fall, 1981.
Prerequisite: APM 391 or equivalent.

635. Multivariate Statistical Methods **(3)**
Estimation and inference for the multivariate normal distribution. Multivariate analysis of variances, factor analysis, principal components analysis, canonical correlation, discriminant analysis, cluster analysis. Spring, 1982.
Prerequisite: One semester of statistics.

651. Operations Research I **(3)**
Two one and one-half hours of lecture. Stochastic OR models applicable to managerial process or systems analysis. Elements of probability theory, theory of games and decision theory, queuing model, simulation techniques with applications to queuing and inventory problems, and, if time permits, Markov chains. Fall, 1981.
Prerequisites: APM 391 and MAT 227 or equivalent.

652. Operations Research II **(3)**
Two one and one-half hours of lecture. Deterministic OR models applicable to managerial problems or systems analysis. Elements of Matrix Algebra, solving simultaneous linear equations, mathematical programming, classical optimization techniques, Lagrange multipliers. Linear programming transportation and allocation models, dynamic programming, network analysis and, if time permits, quadratic, parametric and integer programming. Spring, 1982.
Prerequisites: APM 391 and MAT 227 or equivalent.

EIN—ENVIRONMENTAL INFLUENCES (LANDSCAPE ARCHITECTURE)
(See also courses listed under GRA and LSA.)

311. Natural Processes in Planning and Design **(3)**
Section 1: Landform and Soils
Section 2: Hydrology, Climate and Energy
Section 3: Plant, Animal, and Human Ecology
Three hours of lecture. This course presents an overview of the basic principles governing the dynamics of natural resources and processes which should be understood in planning and designing the human landscape. In each section, sources of reference data application to planning and project scale design will be discussed. Occasional local field trips will be utilized. Fall, 1981.
Prerequisite: Permission of instructor.

371. History of American Landscape Attitudes **(3)**
Three hours of lecture-discussion per week. This course presents, through lectures, readings, and slides, uniquely American historical attitudes toward land and nature as shown through various cultural activities and disciplines, such as painting, architecture, landscape architecture, religion, philosophy, utopianism, exploration and recreation, land development and economics, and certain technological developments. Cultural expressions of the 19th century will be of primary interest, but formative attitudes from the Colonial period and certain 20th century results will be included. One-third to one-half of lecture periods are given over to student reports, criticism, and discussion. Spring, 1982.
Prerequisite: Permission of the instructor.

390. Social/Cultural Influences and Environmental Form **(3)**
Three hours of lecture. This course provides an introduction to an interdisciplinary social science analysis of human settlements. The course introduces the basic concepts, vocabulary, theories, and units of analysis for an interdisciplinary social perspective of the environmental form of human settlements. As such, it focuses upon developing an understanding of the context for the planning and design of human settlements. Course requirements include readings, examinations, and reports. Field trips may be scheduled. Spring, 1982.

451. Fundamentals of City and Regional Planning **(3)**
Three hours of lecture. An introductory survey course in planning. The historical development of American City and Regional Planning, theories of the planning process, the role of planning in public decisionmaking, landmark legislation and judicial decision related to planning, and approaches to controlling land use will be presented. Fall, 1981.

452. Simulated Planning in Metropolitan Systems: Theory and Practice **(3)**
Three hours of laboratory, two hours of lecture/discussion. A computerized simulation designed to provide an understanding of the decisionmaking environment of metropolitan planning. Each participant is assigned a role consistent with his/her background. Lectures provide a theoretical framework for the activities in the simulation; a discussion section provides for evaluation. Computer experience is not necessary. Spring, 1982.

470. Art History **(3)**
Three hours of lecture. Informal lectures will emphasize and review assigned text and other readings and handout notes. Slides will be shown regularly; reports, quizzes and examinations. Evolutionary nature of the main cultural periods of Western man and fine art as man's selected environment will be the course emphasis. Spring, 1982.
Prerequisite: Permission of the instructor.

471. History of Landscape Architecture **(3)**
Three hours of lecture. Informal lectures and class participation, reports, assigned text and assigned reserve shelf reading, optional text and handout notes, quizzes and exams. Slides. Historical study and style analysis of Western man's efforts to design his environment and his changing attitudes and relationships to environment. Also, non-Western coverage where significant or influential on Western Man. Study of historical personalities as well as periods that are of environmental concern up into the modern period. Fall, 1981.
Prerequisite: Permission of the instructor.

510. Creative Problem Solving Seminar **(3)**
Three hours of lecture and discussion. A course designed to extend the student's understanding and application of creative problem solving processes. One requirement will be to select and carry out an application of the techniques to a particular problem, with consultation and guidance from the instructor. Critique and survey of the literature on creativity, in-depth analysis of the synectics process, and various procedures which have been developed for nurturing creative behavior comprise the essence of the program. Fall and Spring, 1981-82.
Prerequisite: Undergraduate degree or permission of the instructor.

ENS—ENVIRONMENTAL SCIENCE

796. Special Topics in Environmental Science and Policy **(1-3)**
Lectures and discussion, seminars, conferences and group research on topics of special or current interest, in fields related to environmental science and policy. See schedule of classes for current offerings. Fall and Spring, 1981-82.

797. Environmental Science Seminar **(1-2)**
Discussion of current topics and research related to environmental science. Fall and Spring, 1981-82.

798. Problems in Environmental Science and Policy **(Credit hours to be arranged)**
Individualized, special study of environmental science and policy subjects and issues. Comprehensive oral or written report required for some problems. Fall and Spring, 1981-82.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1981-82.

999. Doctoral Thesis Research
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1981-82.

The following courses offered by the College and Syracuse University are especially useful to graduate students in GPES:

School of Forestry

RMP 587	Environmental Law
RMP 588	Law of Natural Resources Administration
RMP 602	Resource Economics
RMP 603	Research Methods
RMP 629	Environmental Impact
RMP 641	Soil and Water Conservation
RMP 642	Water Quality Management
RMP 643	Urban Water Resources
RMP 753	Resources Policy

School of Environmental and Resource Engineering

ERE 612	Energy

Syracuse University

GEO 613	New York State: Problems and Prospects
GEO 558	Environmental Quality Analysis
GEO 790	Economic Growth and the Natural Environment
PLA 626	Planning and Policy Analysis
PPA 631	Advanced Public Administration
PPA 701	Washington Seminar: Public Policy and Administration
PPA 707	National Planning
PPA 743	Administrative Law
PPA 745	Intergovernmental Relations
SOC 704	Science, Technology and Society
PTS/NAS 532	Progress and Technology
PTS/NAS 551	Alternative Futures for Technological Society
LPP 675	Environmental Issues in Management

ERE—ENGINEERING (ENVIRONMENTAL AND RESOURCE ENGINEERING)

306. Elements of Map and Air Photo Interpretation (1)

Two hours of lecture and three hours of laboratory per week for five weeks of a semester. Introduction to map and photograph interpretation to extract information useful to site inventory, analysis, planning, and design activities. The physical and geometric properties of maps and photographs, the characteristics of information contained in them, and the principles and procedures of interpretation are discussed. Spring, 1982.

Prerequisite: Junior standing in Landscape Architecture.

308. Elements of Plane Surveying (1)

Two hours of lecture and three hours of laboratory per week for the last five weeks of the semester. Introduction to the principles and procedures of plane surveying for mapping and construction layout purposes. Topics briefly discussed include the basic mathematical principles of surveying, the types and uses of surveying, horizontal and vertical distance measurement, angle measurement, traversing and computations, construction layout, tacheometry, and surveying errors (and their treatment). Spring, 1982.

Prerequisites: Junior standing in Landscape Architecture and college level plane trigonometry.

320. APL for Engineers and Scientists (2 or 3)

Programming and operation of time-sharing digital computer systems via the APL language. Analysis, modeling, and solution of basic problems in environmental science and engineering. Students desiring three credits will complete an original, substantial term project. Fall or Spring, 1981-82.

Prerequisites: Calculus and physics or permission of the instructor.

321. Analog Computation for Engineers and Scientists (1 or 2)
Programming and operation of electronic analog computers. Analysis, modeling, and simulation of dynamic phenomena and systems in environmental science and engineering. Students desiring two credits will complete an original term project. Fall or Spring, 1981-82.
Prerequisites: Calculus and physics or permission of the instructor.

342. Hydraulics in Construction (4)
Three hours of lecture, three hours of laboratory. The physical, mechanical, thermal, and hydraulic properites of fluids relevant to the construction industry. A study of solutions to hydraulic problems in contemporary construction activities. Not open for credit to forest engineering students. Spring, 1982.
Prerequisites: Physics and differential calculus.

350. Wood Preservation (2)
Two hours of lecture with some demonstrations. A survey of basic wood-water relationships, shrinking and swelling, elementary wood structure, wood permeability, capillary forces, heat transmission, agencies of wood deterioration, wood preservation processes, wood fire performance, fire tests, and fire retardant treatments. Not open to WPE students. Fall, 1981.

362. Mechanics of Materials (3)
Three hours of lecture. Theories of stress, deformation, and stability of common structural materials subjected to various force systems. Spring, 1982.
Prerequisites: Integral calculus and statics.

364 Engineering Materials (3)
Two hours of lecture and one three-hour laboratory per week. An introduction to the study of materials science emphasizing the structure and properties of materials used in the construction industry in general. Lab work includes fabrication, testing, and evaluation of actual systems. Spring, 1982.
Prerequisites: Junior standing, physics, chemistry, and engineering mechanics.

371. Surveying for Engineers (3)
Two hours of lecture and recitation and three hours of laboratory. The principles of plane surveying for engineers. Subject matter areas include introduction to the theory of measurement and errors. Linear and angular measurements in both the horizontal and vertical planes, traversing and computations, horizontal and vertical control and associated computations, areal and volumetric computation, circular and parabolic curves, state plane coordinates, public land surveys, and the analysis and treatment of systematic and random errors. Laboratory field work and computations culminate in a topographic map. Fall, 1981.
Prerequisites: Differential and integral calculus.

375. Elementary Corrosion (1)
One hour of lecture. Basic electro-chemistry, film formation and passivation, galvanic corrosion and pitting, cathodic and anodic protection, protective coatings and inhibitors. Application of the above in the home, car, field, at sea, and in industrial plants. Spring, 1982.

377. Process Control (3)
Three hours of lecture. The study of the principles of process control both with and without electronic computers. The emphasis is on sensing and control elements, signal transmission, non-computerized controllers, conversion of signals to digital input for computer programs, control problems such as lag and errors, and applications with emphasis on the paper industry. Spring, 1982.
Prerequisite: College level physics.

420. Computer Applications in Science and Engineering (3)
Principles and methods of mathematical modeling for analog and digital computer solution. Applications to data reduction and correlation, statistical analysis, process and equipment simulation, optimization and control, and computer-assisted instruction. Typical examples, class problems and student projects. Current status and future projection of computation equipment, software and operating techniques. Fall or Spring, 1981-82.
Prerequisites: Calculus and computer programming, or permission of the instructor.

440. Water Pollution Engineering (3)
Two hours of lecture and three hours of laboratory. Introduction to the physical, chemical, and biological parameters of waste water treatment processes and to the principles of the unit operations involved. Study of the design parameters and design procedures of waste water treatment systems. Spring, 1982.
Prerequisites: Physics and CHE 356 or equivalent.

441. Air Pollution Engineering (3)
Three hours of lecture and discussions. Study of the chemical, physical and meteorological principles of air pollution and its control. Local and global effects of air pollution. The atmospheric survey. Examination of the operating principles and design parameters of the various air pollution control systems. Air quality and emission standards. Spring, 1982.
Prerequisites: Physics and CHE 356 or equivalent.

488. Engineering Economics (1)
One hour of lecture and three hours of laboratory; first half of semester. This course provides students with the tools to understand the economic aspects of engineering and to evaluate engineering proposals in terms of worth and cost. Coverage extends through alternatives analysis, using rate of return, present worth, average annual cost and other methods, and evaluation of public activities, focusing on benefit-cost analysis. Spring, 1982.

496 Special Topics (1-3)
Lectures, readings, problems, and discussions. Topics as announced in the areas of environmental or resource engineering. Fall and/or Spring, 1981-82.

563. Photogrammetry I (3)
Two hours of lecture and discussion, three hours of laboratory and discussion. Basic photogrammetric and photo interpretation concepts as a means of acquiring reliable data for engineering and management planning. Potentials, limitations, instrumentation and unique requirements are considered. Fall and Spring, 1981-82.
Prerequisite: ERE 371 or equivalent.

585. Microscopy and Photomicrography (3)
Two hours of lecture, one hour of demonstration, and three to five hours of laboratory. Principles of light microscopy and photomicrography with extensive laboratory practice. Introduction to scanning and transmission electron microscopy. Fall, 1981.
Prerequisite: Permission of the instructor.

596. Special Topics (1-3)
Lectures, conferences, discussions, and laboratory. Topics in environmental and resource engineering not covered in established courses. Designed for the beginning graduate student or selected upper division undergraduate. Fall and/or Spring, 1981-82.

610 Energy: Alternate Systems (3)
Three hours of lecture. An introduction to alternate energy resources and conversion processes. Focus is on relatively small-capacity, decentralized systems and means for judging appropriateness, costs, and impacts of application under varying conditions and needs. Fall, 1981.

611. Energy: Production and Conservation (3)
Three hours of lecture. An introduction to the technology, impacts, hazards, and costs of large-scale, centralized power generation, with emphasis on opportunities for resource conservation. Spring, 1982.

640. Water Resource Systems (3)
Three hours of lecture and discussion. Fundamentals of the systems approach to complex water resource problems. Characteristics of water resource systems, related to systems engineering methodologies. Quantitative and qualitative subsystems are considered in a technical nature which exposes the socio-legal-political interfaces of water resource decisionmaking. Spring, 1982.
Prerequisite: FEG 340 or equivalent.

643. Water Pollution Engineering (3)
Two hours of lecture and three hours of laboratory. Introduction to the physical, chemical, and biological parameters of waste water treatment processes and to the principles of the unit operations involved. Study of the design parameters and design procedures of waste water treatment systems. Spring, 1982.
Prerequisites: Physics and CHE 356 or permission of the instructor.
Note: A student may not enroll in or receive credit for both ERE 440 and ERE 643.

652. Remote Sensing Interpretation (3)
Two hours of lecture and three hours of laboratory. Introduction with a qualitative emphasis on the fundamentals of acquiring, analyzing, and utilizing remote sensing data in the performance of natural resource inventories, environmental quality surveys, site development studies and land use analyses. Oriented for multidisciplinary participation. Fall and/or Spring, 1981-82.
Prerequisites: Physics and calculus or permission of the instructor.
Note: Not open to students having previous credit for FEG 352.

655. Remote Sensing Measurements (3)
Two hours of lecture comprising an in-depth coverage of the theory, design, and application of remote sensing systems and techniques employed to obtain precise spectroradiometric measurements to map and monitor natural resources. Photographic and non-photographic systems are considered. Laboratory experiments in the form of an assignment using remote sensing data. Fall or Spring, 1981-82.
Prerequisites: ERE 572 and FEG 363 or ERE 563 or consent of instructor.

658. Geometric Geodesy (3)
An introductory graduate level course for those without previous background in theoretical geodesy. Topics covered include position determination for short and long lines on the ellipsoid, the ellipsoidal triangle, the parametric equations, three-dimensional geodesy, and mappings of the ellipsoid. Fall, 1981.
Prerequisite: Permission of the instructor.

659. Astronomic and Gravimetric Geodesy (3)
An introductory graduate level course in geodetic astronomy and the gravity field of the earth. Topics covered include updating star positions; precise time keeping; position determination by natural and artificial satellites; the fundamental concepts of gravimetric geodesy, including the potential function; attraction; undulations of the geoid and deflections of the vertical. Fall, 1981.
Prerequisite: ERE 658.

660. Theory of Errors and Adjustments (3)
The theory of errors and adjustments, of observations oriented toward geodesy and photogrammetry. Topics include error definitions, weighted observations, method of least squares, matrix algebra in adjustments, variance-covariance matrix, the error ellipse and the general case of adjustment. Fall or Spring, 1981-82.
Prerequisites: Calculus and a beginning course in statistics.

664. Photogrammetry II (3)
Two hours of lecture and three hours of laboratory. General analytic photogrammetry including interior and exterior orientation systems, intersection, space resection and orientation. Correction of photo coordinates for film deformation, lens distortions, atmospheric refraction and earth curvature. Introduction to photogrammetric plotters. Planning photogrammetric projects, and designing optimum procedures for selected photogrammetric tasks. Fall, 1981.
Prerequisite: ERE 563 or equivalent.

670. Principles of Pulping and Bleaching (3)
Two hours of lecture and three hours of laboratory plus literature study of assigned topics, independent project planning and/or laboratory study. Discussion of pulping and bleaching processes. Effects of chemical and physical variables on the wood components and pulp properties; chemistry involved. Experiments in pulping and bleaching and pulp evaluation. Fall, 1981.
Prerequisites: Organic, physical, and analytic chemistry.
Note: A student may not enroll in or receive credit for both PSE 461 and ERE 670.

671. Chemistry of Pulping and Bleaching **(3)**
Three hours of lecture. Discussion of the chemistry underlying the commercial pulping and bleaching processes, designed to assist in interpreting the phenomena observed in these operations. Emphasis is placed on those reactions which contribute to delignification and the removal of chromophoric groups in lignin and extractives. Spring, 1982.
Prerequisite: FCH 572 or permission of the instructor.

672. Selected Topics in Colloid and Surface Science **(3)**
Three hours of lecture, discussions, and problem solving. The following topics will be covered: 1) viscosity of dilute dispersions, 2) osmotic and equilibrium, 3) light scattering, and 4) surface tension. Fall, 1981.
Prerequisites: Two semesters of physical chemistry and permission of instructor.

673. Selected Topics in Colloid and Surface Science **(3).**
Three hours of lecture, discussions, and problem solving. The following topics will be covered: 1) absorption from solution and at Gas-Solid interface, 2) electrical double layer, 3) Van der Waals attraction and flocculation, and 4) electrophoresis, zeta potential, and electro-osmosis. Fall, 1981.
Prerequisites: Two semesters of physical chemistry and permission of instructor.

675. Principles of Unit Operations **(4)**
Three hours of lecture and discussion and one two-hour computation period. Fundamentals of fluid dynamics, heat and mass transfer, appropriate analogies and process applications. Stage operations and computation methods. Application to distillation, extraction, gas absorption, evaporation, crystallization and drying. Design, operation, and computer simulation of equipment. Fall, 1981.
Prerequisites: Calculus and physical chemistry or permission of the instructor.

677. Paper Properties **(4)**
Three hours of lecture, three hours of laboratory, and discussion plus evaluation of literature, independent project planning and/or laboratory study. Evaluation and study of the physical, optical, and chemical properties of paper and the interrelationships existing between paper manufacturing methods, papermaking additives, test results and the ultimate properties desired in the finished paper. Fall, 1981.
Prerequisite: Permission of the instructor.
Note: A student may not enroll in or receive credit for both PSE 465 and ERE 677.

678. Paper Coating and Converting **(3)**
Two hours of lecture and three hours of laboratory plus evaluation of literature, independent project planning, and/or laboratory study. Evaluation and study of the various coating materials and processes used by the paper industry. Introduction to polymers and their use in converting operations. Study of materials and equipment used in converting operations, fundamentals and parameters which control their use, effects on final properties of papers. Spring, 1982.
Prerequisite: PSE 465 or permission of the instructor.
Note: A student may not enroll in or receive credit for both PSE 466 and ERE 678.

680. The Anatomy and Ultrastructure of Wood **(2)**
Two hours of lecture and/or demonstration and discussion. The gross, microscopic and submicroscopic structure of wood including organization of the cell wall, distribution of chemical constituents and abnormalities in wood. Fall, 1981.

682. Transport Processes **(3)**
Two hours of lecture and three hours of laboratory. The relationship between wood structure and wood permeability, moisture movement, and heat transfer. Fire retardant and wood preservation treatments. Wood drying. Unsteady-state transport processes. An advanced laboratory problem with report in wood-moisture relationships, wood drying, the relationship between wood permeability and treatability, or wood preservative treatments. Spring, 1982.
Prerequisite: Permission of the instructor.
Note: A student may not enroll in or receive credit for WPE 326 or WPE 327 and ERE 682.

683. Structure and Properties of Engineering Materials **(3)**
Three hours of lecture and discussions. Study of the mechanical, thermal, electronic, and magnetic behavior of metals, ceramics, polymers, and composite materials relating internal structure and engineering properties. "Internal structure" may range from subatomic, atomic, and molecular levels through the structure of crystals and amorphous solids up to the macrostructure of multiphase and composite materials. Spring, 1982.
Prerequisite: Permission of instructor.

684. Mechanical Properties of Wood **(3)**
Two hours of lecture and three hours of laboratory. The effect of the anatomical and chemical nature of wood on its response to static and dynamic force systems. The theory of elasticity as applied to wood and wood-based composites. Fall or Spring, 1981-82.
Prerequisite: Permission of the instructor.

685. Applied Electron Microscopy **(5)**
Two hours of lecture, two hours of laboratory/demonstration, minimum of ten hours of individual laboratory. The theory and operation of the transmission electron microscope including specimen preparation, photographic technique and interpretation of micrographs. Fall, 1981.
Prerequisite: Consultation with the instructor.

686. Wood-Water Relationships **(3)**
Two hours of lecture and three hours of laboratory. Relationship between wood moisture content and the environment, electrical and thermal properties, theories of moisture sorption, hygroscopic swelling and shrinking, thermodynamics of moisture sorption, mechanism of moisture movement as it relates to activation theory. Laboratory exercises will complement the theoretical topics discussed in the lecture. Fall, 1981.
Prerequisite: Permission of the instructor.

688. Tropical Timbers in Commerce **(2)**
Two hours of lecture. Introduction to the commercial use of tropical timbers; the factors of forest conditions, stand types and wood qualities influencing their utilization and the development of trade. Sources of information. Spring, 1982.
Prerequisite: Permission of the instructor.

689. Tropical Wood Anatomy **(1)**
Anatomical characters, identification and taxonomy of tropical woods important in commerce. Spring, 1982.
Prerequisite: WPE 387 or ERE 360. Recommended that ERE 688 be taken concurrently or previously.

691. Air Pollution Engineering **(3)**
Three hours of lecture and discussion. Study of the chemical, physical, and meteorological principles of air pollution and its control. Local and global effects of air pollution. The atmospheric survey. Examination of the operating principles and design parameters of the various air pollution control systems. Air quality and emission standards, Spring, 1982.
Prerequisites: Physics and CHE 356 or permission of the instructor.
Note: A student may not enroll in or receive credit for both ERE 441 and ERE 691.

760. Analytical Photogrammetry I **(3)**
Two hours of lecture and three hours of laboratory. Mathematical theory of photogrammetry including space resection, orientation, intersection and aerial triangulation. Fall or Spring, 1981-82.
Prerequisites: FEG 363, APM 360 and FEG 464 or equivalent.

762. Instrumental Photogrammetry I **(3)**
Two hours of lecture and three hours of laboratory. The theory and practice of extracting information from photographs with the aid of photogrammetric plotters. Fall or Spring, 1981-82.
Prerequisite: FEG 363 or equivalent.

775. Applied Thermodynamics **(3)**
The study and application of thermodynamics, including the first and second law, phase relationships, thermochemistry, the production of work and equilibrium relationships. Fall or Spring, 1981-82.
Prerequisites: FCH 360, FCH 361 or equivalent.

785. Scanning Electron Microscopy **(3)**
Two hours of lecture, demonstration and laboratory. Six hours of independent laboratory experience. The theory and operation of the scanning electron microscope including specimen preparation, photographic technique, and interpretation of micrographs. Spring, 1982.
Prerequisite: Permission of the instructor.

796. Advanced Topics **(1-3)**
Lectures, conferences, discussions, and laboratory. Advanced topics in Forest Engineering, Paper Science and Engineering, and Wood Products Engineering. Fall and/or Spring, 1981-82.
Prerequisite: Permission of the instructor.

797. Seminar **(1-3)**
I. Forest Engineering topics. II. Paper Science and Engineering topics. III. Wood Products Engineering topics. Fall and Spring, 1981-82.

798. Research in Environmental and Resource Engineering **(Credit hours to be arranged)**
I. Independent research topics in Forest Engineering. II. Independent research topics in Paper Science and Engineering. III. Independent research topics in Wood Products Engineering. Fall and Spring, 1981-82.

880. Interpretation of Cellular Ultrastructure **(2)**
One hour of lecture and two hours of demonstration and discussion. The organization and sculpturing of the walls of plant cells; the cellulose microfibril, matrix and incrusting substances, and the warty layer. The ultrastructure and function of cytoplastic organelles in cells. The nucleus, the mitochondrion, the chloroplast, the endoplasmic reticulum, microtubules, the gap junction and the tight junction. The tools and techniques used for light and electron microscopic study of cells, and the interpretation of structural evidence. Directed study and discussion of the latest (current) literature on pertinent topics. Spring, 1982.
Prerequisite: Permission of the instructor.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1981-82.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1981-82.

EST—ENVIRONMENTAL STUDIES

100. Introduction to Environmental Studies **(3)**
Lecture and discussion on the nature of man, his social, cultural, economic and political institutions and how these condition his views of the environment. Fall, 1981.

498. Undergraduate Problem **(1-3)**
Interdisciplinary research designed to solve environmental problems. Selection of subject matter to be determined by students in conference with the Undergraduate Environmental Studies Advisory Group. Problem analysis and programs for solution in the form of a final report required. Fall and/or Spring, 1981-82.
Prerequisite: Permission of instructor.

FBL—BIOLOGY (FOREST BIOLOGY)

303. Introductory Environmental Microbiology (4)
Three hours of lecture and three hours of laboratory. An introduction to the biology of microorganisms and viruses and a study of their interactions with other microbes and macroorganisms. Fall, 1981.
Prerequisite: A year course in biology or equivalent.

320. General Ecology (3)
Two hours of lecture, three hours of field trips during the first half of the semester. Three hours of lecture during the second half of the semester. Introduction to ecosystem ecology stressing the dynamic interrelationships of plant and animal communities with their environments, ecological factors, energy flow and trophic levels in natural communities, plant responses and animal behavior, population dynamics, biogeography, and representative ecosystems. The ecological impact of man is reviewed. Spring, 1982.
Prerequisite: A year course in biology or equivalent.

330. Principles of General Physiology (3)
Three hours of lecture. Introduction to the dynamics of living systems with emphasis on the universality of the biological world. Spring, 1982.
Prerequisite: One semester of organic chemistry.

400. Forest Techniques for Biologists (1)
Full-time for one week. Cranberry Lake Biological Station. Techniques of forest stand inventory and measurements; mensurational analysis; stand manipulation, harvesting, regeneration, and protection. Summer, 1982.

405. History of Natural Science (1)
One hour of lecture. A review of the history of western science from pre-Ionian times to Darwin, with evaluation of the impact of culture and religion on scientific progress. Spring, 1982.

420. Field Experience—Internship (5)
Full-time for at least five weeks, or equivalent, of employment with an agency or professional involved in field activity. A resident faculty member is required to serve as course evaluator. Approval of curriculum director is necessary. See advisor for detailed procedural information. Summer, 1982.

421. Ecology of Freshwaters (2)
Half-time for four weeks. Cranberry Lake Biological Station. Experimental and observational studies of environmental and biotic interactions influencing productivity of freshwaters. Basic concepts at the organismic, population, and community level. Summer, 1982.

430. Fungal Physiology (3)
Three hours of lecture and discussion. Principles of growth, morphogenesis, and reproduction of the fungi emphasizing the role of the environment in controlling fungal processes. Spring, 1982.
Prerequisite: FBL 330 or equivalent.

431. Fungal Physiology Laboratory (1)
Three hours of laboratory. Selected experiments in the quantitative study of fungal growth, nutrition, sporulation, and spore germination. Spring, 1982.
Co-requisite: FBL 430.

432. Physiological Ecology of Plants (3)
Three hours of lecture. Examination of the interactions between plants and their environment. Emphasis will be given to the physiology of plants as it is modified by fluctuating external conditions and the mechanisms of plant adaptation. Students completing FBO 432 should not enroll in FBO 330. Spring, 1982.
Prerequisites: Introductory courses in physics, FBO 300, or permission of the instructor.

470. Principles of Genetics (3)
Three hours of lecture and discussion. A general course covering concepts of genetics and evolution base to upper division biology and biochemistry courses. Includes the inheritance and analysis of Mendelian and quantitative traits, the chemical nature of the gene and its action, the genetic structure of populations and their evolution. Numerical methods for characterizing and analyzing genetic data are introduced. Spring, 1982.
Prerequisite: A one-year college introductory biology course.

471. Principles of Genetics Laboratory (1)
Three hours of autotutorial laboratory. Experiments with plants and animals and computer simulation exercises demonstrate the basic principles of inheritance of Mendelian and quantitative traits and changes in populations caused by major forces in evolution or by breeding procedures. Numerical methods for characterizing quantitative traits and for testing hypotheses are introduced. Spring, 1982.
Co-requisite: FBL 470 or equivalent.

472. Introduction to Quantitative and Population Genetics (1)
Ten lecture-discussions and four autotutorial laboratories the second half of the semester (incl. Lecture-Lab Modules 5 and 6 of FBL 470 and 471). Basic genetic concepts of quantitative inheritance, the structure of populations and evolution. Laboratory experiments and computer simulations are used to demonstrate these concepts. Numerical methods for characterizing and analyzing genetic data are introduced. Spring, 1982.
Prerequisite: An introductory genetic lecture-laboratory course deficient in these areas of genetics and permission of instructor.
Note: Not open to students taking FBL 470 and 471.

496. Topics in Biology (1-3)
Experimental, interdisciplinary, or special coursework in biology for undergraduate students. Subject matter and method of presentation varies from semester to semester. May be repeated for additional credit. Fall or Spring, 1981-82.

497. Undergraduate Seminar (1)
Literature surveys and seminars on topics of biological interest and importance. Subject to be generated by faculty and students and to be announced prior to registration. Fall and Spring, 1981-82.

498. Research Problem in Biology (1-3)
Independent research in topics in Forest Biology for the superior undergraduate student. Selection of subject area determined by the student in conference with appropriate faculty member. Tutorial conferences, discussions and critiques scheduled as necessary. Final written report required for departmental record. Fall, Summer and/or Spring, 1981-82.
Prerequisite: Permission of instructor.

500. Forest Biology Field Trip (2)
A seven- to ten-day trip to (1) agencies engaged in biological research, management, and administration, or (2) regions or areas of unusual biological interest. A final report is required. Estimated student expense, $75. Fall or Spring, 1981-82.
Prerequisite: Permission of the instructor.

522. Populations Ecology (3)
Two hours of lecture and three hours of laboratory. Description, analysis, evolution, interactions and stability of natural and experimental populations. Spring, 1982.
Prerequisite: FBL 320 or equivalent.

525. Limnology (3)
Three hours of lecture. An introduction to the physics, chemistry, and biology of inland waters, with particular emphasis on lakes. The course focuses on lakes as integrated ecosystems, and analyzes perturbations in this environment on the structure and function of the biological communities contained therein. Fall, 1981.
Prerequisites: An introductory course in physics, chemistry, and ecology.

526. Limnology Laboratory **(1)**
One laboratory or field trip. An introduction to limnology techniques and the procedures for empirically analyzing ecological relations in aquatic ecosystems. Field trips to local aquatic habitats. FBL 525 must be taken concurrently or previously. Fall, 1981.

530. Microbial Ecology **(3)**
Two hours of lecture and three hours of laboratory. Applied and environmental aspects of microbiology with emphasis on biochemical interactions. Examining microbial processes and interrelationships in aquatic and terrestrial ecosystems. Spring, 1982.

540. Chemical Ecology **(3)**
Two hours of lecture and one hour of discussion. A treatment of biological phenomena incorporating elements of ecology, physiology, and chemistry as a basis for development, behavior, and survival. Emphasis is on the intra- and inter-specific relationships involving chemical messengers at the organismal, population, and community levels. Spring, 1982.
Prerequisites: Organic chemistry, general ecology, general physiology.
Note: FBL 540 is also listed as FCH 540.

635. Membranes and Biological Transport **(3)**
Two hours of lecture and one hour of discussion. Composition, structure, and physical properties of membranes. Membrane functions including transport, bioelectricity, and cell compartmentalization. Specific transport processes in biological systems. Fall, 1981.
Prerequisites: One semester of biochemistry and an advanced physiology course, or permission of the instructor.

796. Topics in Biology **(1-3)**
A course offered by the faculty for students interested in biology. Check the Schedule of Courses for details. Fall and Spring, 1981-82.

997. Biology Seminar **(1)**
One hour of lecture and discussion. The course emphasizes current concepts and developments in biology. Fall and/or Spring, 1981-82.

FBO—BOTANY (FOREST BOTANY AND PATHOLOGY)

300. Structure and Function of Plants **(3)**
Two hours of lecture and three hours of laboratory in the Autotutorial Learning Center. An introduction to plant biology with special emphasis on the structure and functions of the green plant. Fall, 1981.
Prerequisite: A year course in biology or equivalent.

310. Classification of the Plant Kingdom **(3)**
Two hours of lecture and three hours of laboratory. Introductory study of the plant kingdom with emphasis on the angiosperms. Spring, 1982.

315. Dendrology I **(3)**
Two hours of lecture and one three-hour laboratory/field trip. Field study, identification, natural history, and elementary silvics of important forest trees of North America. Fall, 1981.

330. Plant Nutrition **(3)**
Three hours of lecture. Descriptive aspects of the fundamental activities of plants. Subjects to be covered include cell structure, water and mineral metabolism, organic nutrition, and a brief introduction to biological control mechanisms. Will not satisfy the plant physiology requirement of botany majors. Fall, 1981.
Prerequisite: FBO 300 or equivalent.

360. Forest and Shade Tree Pathology **(3)**
Two hours of lecture and three hours of autotutorial laboratory. Major diseases of forest, shade, and ornamental trees and deterioration of forest products will be discussed with emphasis on disease identification, principles of disease development, effects of disease on the host and practical control measure. Spring, 1982.

415. Dendrology II **(1)**
One three-hour field trip/laboratory. A continuation of Dendrology I emphasizing trees and shrubs ecologically important in the Central New York region and economically important in North America. Fall, 1981.

417. Adirondack Flora **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. Field study of the summer flora of the Adirondack Mountains. Summer, 1982.

422. Ecology of Forest Communities **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. Study of the structural and functional characteristics of selected Adirondack forest ecosystems; techniques of vegetational analysis. Special requirement: students must be prepared to go on one over-night camping trip to an isolated study area. Summer, 1982.

425. Plant Ecology **(3)**
Two hours of lecture and discussion and one laboratory session. A first course in plant community ecology dealing with the dynamics of community development and change and the process of community analysis and description. Fall, 1981.
Prerequisite: FBL 320.

427. Bryoecology **(3)**
Two hours of lecture and one three-hour laboratory or field trip. A study of the taxonomic diversity and ecological adaptations of Bryophytes in regional ecosystem. Spring, 1982.

428. Wetland Plant Ecology **(1-2)**
Full-time for one week. Cranberry Lake Biological Station. Study of wetland plant community dynamics and environmental relationships in the Adirondack Mountain Region. Summer, 1982.

432. Physiological Ecology of Plants **(3)**
Three hours of lecture. Examination of the interactions between plants and their environment. Emphasis will be given to the physiology of plants as it is modified by fluctuating external conditions and the mechanisms of plant adaptation. Students completing FBO 432 should not enroll in FBO 330. Spring, 1982.
Prerequisites: Introductory courses in physics, FBO 300, FBL 320, or permission of the instructor.

460. Field Problems in Forest Pathology **(1)**
Full-time for one week. Cranberry Lake Biological Station. Field study of important tree diseases in the Adirondacks, including heart-rots, root-rots, cankers, rusts, foliage diseases, mistletoe, and physiological diseases. Also field study of mycorrhizae and other tree-root mutualisms. Summer, 1982.

461. Principles of Forest Pathology **(3)**
Three hours of lecture, discussion or laboratory. Concepts and principles of tree diseases in relation to forest practices and practical experience in disease diagnosis and impact evaluation. Fall, 1981.
Prerequisite: FBO 360 or permission of the instructor.

465. Field Mycology **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. An introduction to the collection and identification of the Adirondack fungal flora. Field techniques and laboratory identification of the major fungi found in selected ecosystems. Summer, 1982.

490. Plant Propagation **(1)**
One combined lecture-demonstration-laboratory plus supervised greenhouse assignments. Instruction in principles and practices of plant propagation and in related greenhouse operations. Fall and Spring, 1981-82.
Prerequisite: Senior status in biology curriculum.

510. Mycology (5)
Three hours of lecture and six hours of laboratory. Fundamentals of the morphology, taxonomy, cytology, life histories, and ecology of fungi. Laboratory experience in culturing and identifying fungi. Fall, 1981.
Prerequisite: FBO 310 or FBO 360.

515. Systematic Botany (3)
Two hours of lecture and three hours of laboratory. Identification, nomenclature, and classification of flowering plants with special emphasis on local flora and on developing the ability to classify the plants of any region. Fall, 1981.
Prerequisites: FBO 300, FBO 310 or permission of the instructor.

530. Plant Physiology (3)
Three hours of lecture. Internal processes and conditions in higher plants with emphasis on physiological and biochemical concepts. For students majoring in the biological sciences. Spring, 1982.
Prerequisites: FBO 300, FBL 330, or permission of the instructor.
Note: Botany majors electing this course for their concentration must also take FBO 531.

531. Plant Physiology Laboratory (2)
Two laboratory sessions. Introduction to current methods and procedures of physiological research including nutrition, tissue culture, photosynthesis, respiration, and hormonal regulation of growth. Spring, 1982.
Prerequisites: FBL 330, co-requisite FBO 530, or permission of the instructor.

562. Wood Microbiology (3)
Two hours of lecture and three hours of laboratory/field trip. Major types of fungus defects of wood and its products and principles of control. Special emphasis on chemistry of wood decay, wood durability, toxicants, lumber discolorations, heart-rots and decay in forest products. Fall, 1981.
Prerequisites: Organic chemistry, FBO 360, or permission of the instructor.

585. Plant Anatomy (3)
Two hours of lecture and three hours of laboratory. An introductory course in plant anatomy designed to familiarize the student with the organization and development of the primary and secondary plant body of higher plants. Spring, 1982.
Prerequisite: FBO 300.

600. Plant Virology (3)
Three hours of lecture. The structure function, and replication of virus particles. Transmission mechanisms, vector relationships, symptomatology, and disease control strategies also will be covered in detail. Spring, 1982.
Prerequisites: Two courses in general biology plus organic chemistry or permission of the instructor.

601. Plant Virology Laboratory (2)
Four hours of laboratory. Methodologies necessary to manipulate viruses and to identify and fully characterize virus unknowns will be presented. Spring, 1982.
Prerequisite: FBO 600 or permission of the instructor.

625. Plant Ecology (3)
Two hours of lecture and discussion and one laboratory/discussion. A first course in plant community ecology for beginning graduate students focusing on dynamics of community development and change and the processes of community analysis and description. Fall, 1981.
Prerequisite: FBL 320, or equivalent.

630. Fungus Physiology (3)
Two hours of lecture and one hour of discussion. Principles of growth, reproduction, and differentiation of the fungi emphasizing the role of the environment in controlling fungal processes. Spring, 1982.
Prerequisite: Two semesters of physiology or biochemistry.

636. Photosynthesis (3)
Two hours of lecture and one hour of discussion. Advanced study of photosynthesis on the cellular and organismal level. Specific topics will reflect basic concepts and current emphasis in this field. Fall (odd years), 1981.
Prerequisite: Two semesters of physiology or a course in biochemistry.

660. Phytopathology (3)
Two hours of lecture and discussion and three hours of autotutorial laboratory. Principles and concepts of plant pathology. Major diseases of ornamental plants, vegetable crops, fruit crops, field crops, and trees. This is an introductory plant pathology course for graduate students in all departments. Spring, 1982.

661. Principles of Forest Pathology (3)
Four hours of lecture, discussion, and laboratory. Concepts and principles of tree diseases in relation to forest practices and practical experience in disease diagnosis and impact evaluation. Fall, 1981.
Prerequisite: FBO 360, 660, or permission of the instructor.

665. Principles and Practices of Tree Disease Control (3)
Two hours of lecture and three hours of laboratory or discussion. An advanced course considering the major chemical, cultural, and biological practices and integrated disease management strategies for tree disease control. Spring, 1982.
Prerequisites: FBO 510, 461, or permission of the instructor.

725. Topics in Plant Ecology (2)
Two hours of seminar and discussion. An advanced course dealing with current research in plant community dynamics. May be repeated for additional credit. Fall, 1981.
Prerequisite: FBO 425 or 625 or permission of the instructor.

733. Techniques in Plant Physiology (2-4)
Comprehensive study of techniques essential for research in plant physiology. Students may choose the instructors they wish to work with, and should consult the instructors for further details. May be repeated for credit in different specialties. Fall, 1981.
Prerequisites: FBO 530 and 531 or an equivalent physiology course, biochemistry with laboratory, or permission of the instructor.

761. Topics in Phytopathology (3)
Two two-hour lectures and discussions. Discussions of specific subjects in phytopathology and wood microbiology. Topic selection is based on availability of expertise and will be announced in advance.This course may be repeated for credit in different specialties. Fall or Spring, 1981-82.

763. Mycorrhizae (3)
Two hours of lecture and three hours of laboratory/discussion. A basic background course covering structural, functional, and ecological aspects of mycorrhizae; their methods of field and laboratory study; and applications in forestry practice. Fall (odd years), 1981.

797. Botany Seminar (1)
Seminar discussions of subjects of interest and importance to the biology of plants. Fall and Spring, 1981-82.

798. Research in Forest Botany (Credit hours arranged according to nature of problem)
Advanced study in research problems in forest pathology, wood deterioration, tree physiology, anatomy, mycology, ecology, taxonomy, and genetics. Typewritten report required. Fall and Spring, 1981-82.

810. Advanced Mycology, Homobasidiomycetes (3)
Review of selected literature as well as laboratory training in identification and research techniques. Fall, 1981.
Prerequisite: FBO 510.

811. Advanced Mycology, Heterobasidiomycetes **(3)**
Review of selected literature as well as laboratory training in identification and research techniques. Spring (even years), 1982.
Prerequisite: FBO 510.

812. Advanced Mycology, Ascomycetes **(3)**
Review of selected literature as well as laboratory training in identification and research techniques. Fall (even years), 1982.
Prerequisite: FBO 510.

813. Advanced Mycology, Myxomycetes, Phycomycetes, Fungi Imperfecti **(3)**
Review of selected literature as well as laboratory training in identification and research techniques. Spring (odd years), 1983.
Prerequisite: FBO 510.

830. Physiology of Growth and Development **(2)**
Lecture. A study of the growth and development of plants and the physiological and biochemical processes that influence the development of form and structure in higher plants. Fall (even years), 1982.
Prerequisites: FBO 530, 585, and organic chemistry or permission of the instructor.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1981-82.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1981-82.

FCH—CHEMISTRY

222. Organic Chemistry Laboratory I **(1)**
One three-hour laboratory. Laboratory techniques in organic chemistry. Melting points, distillation, recrystallization, extraction, column and thin layer chromatography, natural product isolation. Qualitative functional group analysis. Fall, 1981.

223. Organic Chemistry II **(3)**
Two hours of lecture, one hour of recitation. A study in depth of the reactivity characteristics of the various classes of carbon compounds. The relation of chemical reactivity and physical properties to electronic and three-dimensional characteristics of carbon compounds. Spring, 1982.
Prerequisite: One semester of organic chemistry.

224. Organic Chemistry Laboratory II **(1)**
One three-hour laboratory. Continuation of FCH 222. Simple physical, quantitative, and instrumental techniques applied to organic chemistry. Gas chromatography, polarimetry, kinetics. Introduction to synthesis. Spring, 1982.
Prerequisite: FCH 222 or equivalent.
Co-requisite: FCH 223 or equivalent.

225. Organic Chemistry I **(3)**
Two hours of lecture, one hour of recitation. A survey of representative classes of carbon compounds with emphasis on structure, fundamental reactivity, and other important properties and characteristics relevant to biological systems. Fall, 1981.

226. Organic Chemistry II **(3)**
Three hours of lecture and discussion. The structure and reactivity of organic compounds, utilizing natural products as examples, will be studied in order to develop an organic chemical background for further study of biological chemistry. Spring, 1982.
Prerequisite: FCH 225 or equivalent.

325. Organic Chemistry III **(4)**

Two hours of lecture, one six-hour laboratory. Classical and recent literature synthesis or organic compounds, employing advanced techniques. Fall, 1981.

Prerequisite: Two semesters of elementary organic chemistry.

360. Physical Chemistry **(3)**

Three hours of lecture. Includes discussion on the properties of gases and liquids, laws of thermodynamics, solutions and colligative properties, and electrochemical cells. Fall, 1981.

Prerequisites: One year of college physics, differential and integral calculus.

361. Physical Chemistry **(3)**

Three hours of lecture. Includes discussion on the structure of matter, principles of quantum mechanics, spectroscopy, and chemical kinetics. Spring, 1982.

Prerequisite: Physical Chemistry FCH 360 or the equivalent.

380. Instrumental Methods of Analysis **(3)**

Two hours of lecture and one three-hour laboratory. Lecture includes theory, applicability, and limitations of a number of current methods of instrumental analysis. Laboratory sessions provide practice with several of these techniques. Spring, 1982.

Prerequisites: General chemistry and quantitative analysis.

384. Spectrometric Identification of Organic Compounds **(1-2)**

Two hours of lecture and discussion. The first half semester (1 credit) will deal with common classes of organic compounds; the second half semester (1 credit) will deal with more complex structures. The use of complementary information from mass, infrared, nuclear magnetic resonance, and ultraviolet spectrometry will be applied to identification of organic natural products. Spring, 1982.

Prerequisites: Organic chemistry; one semester of advanced organic chemistry for second credit.

410. Topics in the Chemistry of Pollution **(1-3)**

Three hours of lecture. Discussion of some specific areas of current concern to the environmental chemist. Lectures by staff members supplemented by outside speakers from industry and governmental agencies. This course is taught in modules. Spring, 1982.

Prerequisites: Organic chemistry and permission of the instructor.

495. Introduction to Professional Chemistry **(1)**

The professional chemist and his relationships with industry, government, and universities. Employment opportunities for the chemist, professional organizations, and unions will be discussed. The selection of a senior research topic and a literature survey will be required. Fall, 1981.

Prerequisite: Senior status.

496. Special Problems in Chemistry **(1-3)**

An opportunity for a special problem, technique development, independent or unstructured study in an area related to the chemical profession. The work may be technical, professional, or interdisciplinary. Advisors outside this department may be solicited. A brief proposal must be presented for approval with specific arrangements outlined including faculty advisor and objectives of the study. Evidence of competence and appropriate effort is required for credit. A written report will be expected. Fall and Spring, 1981-82.

Prerequisite: Upper division status.

497. Undergraduate Seminar **(1)**

One hour per week. Literature surveys and seminars on topics of current research interest and recent advances in chemistry. Spring, 1982.

498. Introduction to Research **(5)**

Eighteen hours of laboratory, library search and report writing. Solution of a selected research problem using special laboratory techniques. Typewritten report on data, procedures, results, and conclusions. Spring, 1982.

510. Environmental Chemistry I **(3)**

Three hours of lecture. Introduction to the processes that control chemical behavior in aquatic environments, including precipitation, gas exchange, acid-base, redox, complexation, and adsorption reactions. Emphasis will be on explanation and prediction of chemical behavior, using computer models where appropriate. Examples will be from the areas of water and wastewater treatment, pollutant fates and geochemistry. Fall, 1981.

Prerequisites: An introductory course in physical chemistry is required and a shortcourse in computer programming is recommended.

511. Environmental Chemistry II **(3)**

Three hours of lecture. Includes a detailed chemical explanation of current topics of concern in environmental chemistry and the chemistry of pollution. Lectures will cover topics relating to air, soil and biota pollutional impact. Spring, 1982.

Prerequisite: Chemistry through physical chemistry, or consent of the instructor.

515. Methods of Environmental Chemical Analysis **(3)**

One hour of lecture and six hours of laboratory. An introduction to sampling, analytical and quality control procedures necessary to obtain reliable water quality data. All analyses will be performed on a single aquatic system with the purpose of developing a final report characterizing the water quality of that system. Fall, 1981.

Prerequisite: A course in quantitative chemical analysis.

519. Environmental Chemistry Seminar **(1)**

One hour of lecture. Seminars on current research and issues in environmental chemistry and related areas. Spring, 1982.

520. Nuclear and Radiation Chemistry **(2)**

The two one-hour lectures will cover the information required for the basic understanding of nuclear reactions, the types of radiation emitted, the instrumentation necessary to detect and measure this radiation, the principles of radioisotope tracer techniques, and radiation chemistry which is the effect of radiation on organic systems. Visits to the Cornell Reactor and the Nuclear Medicine Department of the Upstate Medical Center will be arranged. Spring, 1982.

Prerequisites: Physical, organic and inorganic chemistry or by permission of the instructor.

Note: This course can be taken independently of FCH 521.

521. Nuclear Chemical Techniques **(1)**

The laboratory will consist of one four-hour laboratory class every two weeks, with one hour to be made up at the student's discretion to accommodate counting periods which extend over several weeks. A short movie by the AEC each week will be required for the sixth hour. The laboratory will give each student the opportunity to use the individual counting instruments, gain experience in the handling and preparation of radioactive samples and the use of the 1000-curie-cobalt source in radiation chemistry. Spring, 1982.

Prerequisites: Physical, organic, and inorganic chemistry or permission of the instructor. Advanced tentative registration is required.

Co-requisite: FCH 520.

530. Biochemistry I **(3)**

Three hours of lecture. General biochemistry with emphasis on cellular constituents and metabolic reactions. The chemical, physical, and biological properties of amino acids, proteins, carbohydrates and their intermediary metabolism will be discussed. The chemistry of enzymes, energy transfers, and biological oxidations will also be covered. Fall, 1981.

Prerequisites: One year of organic chemistry and one year of physical chemistry.

531. Biochemistry Laboratory **(2)**

Six hours of laboratory. This course will stress techniques used in biochemical research. Techniques used include various types of chromatography, electrophoresis, and spectrophotometry and methods involved in the isolation, purification, and assay of enzymes. Fall, 1981.

Prerequisite: One semester of quantitative analysis with laboratory.

532. Biochemistry II (3)

Three hours of lecture. Topics discussed are: application of tracer techniques to biochemistry, the chemical and biochemical properties of lipids, theories on the origin of life, photosynthesis and the biosynthesis of steroids and terpenes, plant aromatics, amino acids, porphyrins and other aspects of nitrogen metabolism. Spring, 1982.

Prerequisites: FCH 530 and its prerequisites.

539. Principles of Biological Chemistry (3)

Three hours of lecture. Principles of biochemistry with emphasis on their relationship to biology. Topics include basic metabolic pathways, structure, and function of proteins, enzymes, and nucleic acids, energy relationships and biochemical control mechanisms. Nonchemistry majors. Fall, 1981.

Prerequisite: A two-semester course in organic chemistry is desirable, but a one-semester course is acceptable.

540. Chemical Ecology

This course is the same as FBL 540. Refer to description on page 00.

Note: Credit cannot be received for both FCH 540 and FBL 540.

550. Introduction to Polymer Science I: Polymer Synthesis and Mechanisms (3)

Three hours of lecture. Introduction to the synthesis of polymers and the mechanism of polymerization processes. Addition homopolymerization and copolymerization by radical, ionic and coordination type catalysts. Synthesis of block and graft copolymers. Stepwise polymerization, network formation and gelation. Structure of polymers and stereoregular polymerization. Degradation of polymers, reaction on polymers, polyelectrolytes. Fall, 1981.

Prerequisites: One year of organic chemistry and one year of physical chemistry.

551. Polymer Techniques (2)

One hour of lecture and discussion and three hours of laboratory; lab reports. Techniques of polymer preparation: free radical solution and emulsion polymerization, gel permeation. Molecular weight determination by light scattering, osmometry, viscosity, gel chromatography. Structure characterization by X-ray diffraction, electron microscopy, nuclear magnetic polarized microscopy, stress-strain and swelling equilibrium and thermal analysis. Fall, 1981.

Prerequisites: One year of organic and one year of physical chemistry.

552. Introduction to Polymer Science II: Polymer Properties and Technology (3)

Three hours of lecture. Introduction to the physical chemistry, physics, processing and technology of synthetic polymers. Polymer solutions, including molecular weight determinations and chain statistics. Polymer solid states, including rubber elasticity, viscoelasticity, the glassy state and the crystalline state. Properties, processing and technology of films, fibers, elastomers and foams. Spring, 1982.

Prerequisites: One year of organic chemistry and one year of physical chemistry.

571. Wood Chemistry I: General Wood Chemistry (2)

Two hours of lectures. Introduction to carbohydrate chemistry. Chemistry of cellulose, hemicelluloses, and lignin. Cellulose derivatives. Distribution of polysaccharides and lignin in wood. Wood extractives. Chemistry of bark. Formation of heartwood. Wood as a chemical raw material. Fall, 1981.

Prerequisite: One or two semesters of a three credit undergraduate course in organic chemistry.

572. Wood Chemistry II: Wood and Pulping Chemistry (3)

Three hours of lectures. Introduction to carbohydrate chemistry. Chemistry of cellulose, hemicelluloses, and lignin. Cellulose derivatives. Distribution of polysaccharides and lignin in wood. Wood extractives. Chemistry of bark. Formation of heartwood. Wood as a chemical raw material. Chemistry of the industrial pulping processes with emphasis on sulfite and kraft pulping of wood. Chemistry of the major bleaching agents. Chemical byproducts in the pulping industry. Complete tree utilization in the manufacture of pulp and paper. Fall, 1981.

Prerequisite: One or two semesters of a 3-credit undergraduate course in organic chemistry.

573. Wood Chemistry III: Biosynthesis of Wood **(2)**
Two hours of lecture. Chemistry of pectin and starch. Photosynthesis with emphasis on the chemical phase. Chemistry of the primary cell wall in plants. Biosynthesis of cellulose, hemicelluloses, pectin, and starch. Biosynthesis of aromatics, including lignin. Biodegradation of wood. Spring, 1982.
Prerequisite: FCH 571 or an equivalent course in general wood chemistry.

574. Wood Chemistry IV: Wood Chemistry Laboratory **(1)**
Three hours of laboratory. Reports. Gravimetric and spectrophotometric determinations of lignin. Determination of the number-average molecular weight of ethylcellulose by osmometry. Estimation of the weight-average molecular weight of ethylcellulose by viscometry. Calibration of a gel permeation chromatography (GPC) column. Separation and characterization of larch arabinogalactans A and B by GPC. Fall, 1981.
Prerequisite: FCH 571 Wood Chemistry I or an equivalent course in general wood chemistry.

630. Plant Biochemistry **(3)**
Three hours of lecture and discussion. Includes the biochemistry of photosynthetic electron transport and phosphorylation, photosynthetic carbon fixation, photorespiration, nitrogen fixation, nitrate reduction, photochrome, and plant hormones. The economic, ecological, and environmental aspects of plant biochemistry will also be discussed. Spring, 1982.
Prerequisites: FCH 530—532 or FCH 539 or equivalent.

650. Physical Chemistry of Polymers I **(3)**
Three hours of lecture. Includes: thermodynamics of polymer solutions, phase equilibria, fractionation, structure-property relationships, elementary chain statistics, molecular geometry, network elasticity, polyelectrolyte theory, and viscosity. Fall, 1981.
Prerequisites: One year of organic chemistry and one year of physical chemistry.

651. Physical Chemistry of Polymers II **(3)**
Three hours of lecture. Viscoelasticity. The glassy state and glass transition temperature. The crystalline state and crystallization kinetics. Characterization of structure and morphology of polymer solid states. Survey of structure and properties of native polymers. Spring, 1982.
Prerequisites: One year of organic and one year of physical chemistry.

652. Organic Chemistry of Polymers I **(3)**
Three hours of lecture. A broad survey of the chemistry of polyfunctional molecules and methods for their conversion to high molecular weight materials. Synthesis of a variety of specialty polymers and chemical reactions on natural and synthetic polymers. Some relations between molecular structure and useful properties. Fall, 1981.
Prerequisite: One year of organic chemistry.

653. Organic Chemistry of Polymers II **(3)**
Three hours of lecture. Kinetics and mechanism of polymerization processes, with emphasis on addition polymerization reactions initiated by radical, cationic and anionic initiators. Mechanism of stereospecific polymerization. Structure of polymers. Reactions on polymers and their modification for specific end uses. Block and graft polymers. Spring, 1982.
Prerequisites: One year of organic chemistry and one year of physical chemistry.

681. Principles of Physical Chemistry **(2)**
Two hours of lecture on chemical kinetics. Collision theory in the gas phase, transition state theory, kinetics in liquid solutions, ionic reactions including electron transfer reactions, rate equations near equilibrium, enzyme kinetics, and photochemical reactions. Spring, 1982.
Prerequisites: CHE 656 (Chemical Thermodynamics) or permission of the instructor.

682. Principles of Organic Structure and Synthesis **(3)**
Three hours of lecture and discussion. A broad survey of strategies for constructing organic molecules and of physical and chemical methods for the elucidation of structure. Emphasis on material relevant to different chemical disciplines. Fall, 1981.
Prerequisite: One year of organic chemistry.

796. Special Topics in Chemistry **(1-3)**
(Credit hours arranged according to nature of topic)
Lectures, conferences, and discussion. Advanced topics in physical chemistry, organic chemistry, or biochemistry. Fall and Spring, 1981-82.

798. Research in Chemistry(Credit hours arranged according to nature of problem)
Independent research in physical and organic chemistry of synthetic polymers, physical and organic chemistry of natural polymers, organic chemistry of natural products, ecological chemistry and biochemistry. One typewritten report required. Fall and Spring, 1981-82.

884. Organic Natural Products Chemistry **(3)**
Three hours of lecture. The chemistry of terpenoids, steroids, and alkaloids with an emphasis on the determination of structure by both modern instrumental methods and chemical degradation. Biogenetic considerations and the confirmation of structure by synthesis are covered. Fall or Spring, 1981-82.
Prerequisite: One semester of advanced organic chemistry.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1981-82.

997. Seminar **(1)**
Seminars scheduled weekly; an average of twenty to thirty seminars are given annually. Discussion of recent advances in chemistry. Credit is given only once to a student. Fall and Spring, 1981-82.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1981-82.

FEG—FOREST ENGINEERING

300. Introduction to Forest Engineering and Design **(2)**
One hour of lecture and three hours of laboratory. An introduction to the design process with emphasis on the application of engineering fundamentals to the analysis and design of systems useful in resource manipulation and development. Fall, 1981.

340. Engineering Hydrology, and Flow Controls **(4)**
Three hours of lecture and three hours of laboratory and discussion. Analysis of the waters of the earth, their occurrence, circulation, and distribution; physical properties and their interaction with their environment. Principles of hydrologic budgeting and routing; and basic hydraulics of open channel, conduit, groundwater and overland flow. Applications of probability as a basis for the design of solutions to groundwater, surface runoff, flooding and water supply problems. Spring, 1982.
Prerequisites: CIE 327, IOR 326, and APM 360.

350. Introduction to Remote Sensing for Engineers **(2)**
Two hours of lecture. The fundamentals of acquiring, analyzing, and utilizing remote sensing data in the performance of natural resource inventories, environmental quality surveys and site development analyses. Oriented for multidisciplinary participation. Spring, 1982.
Prerequisite: Junior standing and FEG 363 (which may be taken concurrently with FEG 350).

352. Introduction to Remote Sensing **(3)**
Two hours of lecture and three hours of laboratory. Qualitative and quantitative introduction to the fundamentals of acquiring, analyzing, and utilizing remote sensing data in the performance of natural resource inventories, environmental quality surveys, site development studies, and land use analyses. Oriented for multidisciplinary participation. Fall and Spring, 1981-82.
Prerequisites: Physics and calculus or permission of the instructor.

363. Photogrammetry (3)

Two hours of lecture and discussion, three hours of laboratory. Basic photogrammetric and photo interpretation concepts as a means of acquiring reliable data for engineering and management planning. Potentials, limitations, instrumentation, and unique requirements are considered. Fall and Spring, 1981-82.

Prerequisite: ERE 371 or equivalent.

410. Structures (4)

Three hours of lecture, three hours of computation laboratory and discussion. Engineering principles in the analysis, planning design and construction of components and framed structures under various types of loadings. The proportioning of wood, steel and concrete members and the design of statically determinate structural systems. Emphasis is placed on the relationship between theoretical stress analysis and codes and specifications for appropriate materials and structural design practices. Fall, 1981.

Prerequisites: ERE 362, APL Computing.

422. Production Systems Engineering (4)

Four hours of lecture. An introduction to concepts and procedures for planning, designing, and managing production and large-scale physical systems with focus on forest resources and products. Systems analysis and quantitative techniques are introduced as design tools. Fall, 1981.

Prerequisites: IOR 326 and senior standing in forest engineering.

437. Transportation Systems (4)

Three hours of lecture and three hours of laboratory. Interrelationships among natural features, transportation types, design, and management objectives to provide the most effective system within the given framework. Basic engineering principles in the planning location, design, construction, and maintenance of suitable transportation systems to serve various aspects of forest resource management. Spring, 1982.

Prerequisites: CIE 437, FEG 422.

447. Hydrologic and Quality Controls (3)

Two hours of lecture and three hours of laboratory. A continuation of FEG 340 coupled with principles and practices of water quality control for forested sites and low density areas. Design of facilities and systems for water, sewerage and waste water treatment and for the abatement of pollution from nonpoint sources. Planning and analysis for water resources development. Spring, 1982.

Prerequisites: FEG 340, ERE 488 and CIE 437 or equivalent as evaluated by instructor.

464. Photogrammetry II (3)

Two hours of lecture and three hours of laboratory. General analytic photogrammetry including interior and exterior orientation systems, intersection, space resection, and orientation. Correction of photo coordinates for film deformation, lens distortions, atmospheric refraction, and earth curvature. Introduction to photogrammetric plotters. Planning photogrammetric projects and designing optimum procedures for selected photogrammetric tasks. Fall, 1981.

Prerequisite: FEG 363.

477. Survey Systems Design (3)

Three hours of lecture and discussion. Land survey systems including the U.S. Public Land System, plane coordinate systems, and land use and resource systems—Specifications for Surveying and Mapping Projects. The design of future systems. Spring, 1982.

Prerequisites: FEG 371 and FEG 363.

489. Forest Engineering Planning (3)

Two hours of lecture and three hours of laboratory. A curriculum capstone course designed to integrate other coursework with a systematic approach to real life engineering problems. Semester-long laboratory projects are selected to provide experience in dealing not only with technical and economic constraints, but also with environmental, social, legal, and political aspects of the planning process. Spring, 1982.

Prerequisite: Senior standing in forest engineering.

498. Research Problem in Forest Engineering **(1-3)**
Independent research in topics in Forest Engineering for the highly motivated undergraduate student. Selection of subject area determined by the student in conference with appropriate faculty member. Tutorial conferences, discussions and critiques scheduled as necessary. Final written report required for departmental record. Fall and Spring, 1981-82.
Prerequisite: Permission of the instructor.

FEN—ENTOMOLOGY (FOREST ENTOMOLOGY)

300. Principles of Forest Entomology **(3)**
Two hours of lecture, three hours of laboratory field work. Elements of insect classification, living requirements and control manipulations that are prerequisite, with further study, to an understanding of insects in relation to applied aspects of forestry. Spring, 1982.

350. Elements of Forest Entomology **(3)**
Two hours of lecture, three hours of laboratory/field work. General classification of insects, morphology, physiology, ecology behavior, and basic principles of population control. Emphasis through illustration is on the role of insects in the forest environment. Fall, 1981.
Prerequisite: FBO 300.

402. Forest and Shade Tree Entomology **(3)**
Two hours of lecture, three hours of laboratory/field trip. Important forest and shade tree insects; detection, evaluation, prevention and control of their damage; their relation to silviculture and management of forests and shade trees. Spring, 1982.
Prerequisite: FEN 350 or FEN 300.

404. Wood Deterioration by Insects **(3)**
Three hours of lecture, discussion, and demonstration. Biology, identification, ecology of insect and wood interrelations; prevention of injury and control of insects injurious to forest products and wood in use. Spring, 1982.
Prerequisite: FEN 350, FEN 300 or permission of the instructor.

450. Forest and Aquatic Insects **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. The forest and aquatic insects of Cranberry Lake Region and their role in these environments and habitats. Insect collection required. Summer, 1982.

451. Pest Management—Theory and Practice **(2)**
Two hours of lecture for nine weeks; then one lecture hour and one three-hour laboratory for four weeks. A review of history and governmental policy of pest management, as well as basic instruction in theory and practicum. Spring, 1982.

452. Principles of Chemical Control **(3)**
Two hours of lecture; one three-hour laboratory. A study of the chemistry, toxicology, handling and application of chemicals used to manage pest populations. A primer for the State Pesticide Application examinations. Fall, 1981.
Prerequisite: FEN 451.

453. Biological Control **(2)**
Two hours of lecture. Theory and practice of biological control of insect pests and weeds. Emphasis on the ecology of major groups of predators, parasitoids, and pathogens used in pest management and interpretation of mortality. Fall, 1981.

460. Insect Behavior and Ecology **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. Descriptive, comparative, and experimental behavior of aquatic and terrestrial insect species of the Cranberry Lake Region. Field project, involving field study and paper required. Ecology of forest insects and field techniques used in their study. Emphasis on functional roles played by insects in forest ecosystems. Summer, 1982.
Prerequisite: FEN 350 or equivalent; background in introductory biology and ecology.

490. Medical Entomology **(3)**
Three hours of lecture and recitation. Study of arthropods affecting man, domestic animals, and wildlife with emphasis on their biology, control, and relationship to vertebrate disease. Spring, 1982.
Prerequisite: A beginning course in biology, entomology, zoology or permission of the instructor.

510. Arachnology **(3)**
Two hours of lecture and discussion and three hours of laboratory. Introduction to biology and ecology of spiders, mites, scorpions and other arachnid groups. Laboratories emphasize classification and identification of specimens. Spring (even years), 1982.
Prerequisite: Course in general entomology or invertebrate zoology.

520. Aquatic Entomology **(3)**
Two hours of lecture and three hours of laboratory. The biology, ecology and identification of fresh water insects, with emphasis on the role of aquatic insects in the hydrobiome. Fall, 1981.
Prerequisite: FEN 350 or equivalent.

560. Environmental Toxicology of Insecticides **(2)**
Two hours of lecture. Basis of action of insecticides in living systems, behavior of insecticides and microtoxicants in environment, interaction of insecticides and biological systems. Fall, 1981.
Prerequisite: FBL 330 or equivalent course in physiology or biochemistry.

580. Insect Morphology **(3)**
Two hours of lecture and three hours of laboratory. A comparative study of the external morphology of insects emphasizing evolutionary trends, especially modifications of homologous structures. Topics of special importance include intersegmental relationships, feeding, sensory mechanisms, locomotion, and reproduction. Spring, 1982.
Prerequisite: FEN 350.

610. General Insect Taxonomy **(3)**
Two hours of lecture and three hours of laboratory. Identification and classification of the important orders and families of insects; acquaintance with pertinent taxonomic literature and use of keys; and understanding of evolutionary principles and concepts and a knowledge of systematic theory and practice. Insect collection required. Fall, 1981.
Prerequisites: FEN 350, FEN 580.

630. Insect Physiology **(3)**
Two hours of lecture and three hours of laboratory. Study of the life processes in insects; introduction to modern physiological instrumentation and laboratory methods. Spring, 1982.
Prerequisite: FBL 330.

660. Insecticide Toxicology Laboratory **(2)**
One hour of discussion and three hours of laboratory. Laboratory experiments in mode of action and behavior of insecticides, biological and instrumental analysis of insecticides including tracer analyses. Spring (odd years), 1983.
Prerequisites: FEN 560 or equivalent and permission of the instructor.

796. Special Topics in Forest Entomology
(Credit hours arranged according to nature of work)
Special instruction, conference, advanced study, and research projects in the fields of insect toxicology, insect physiology, taxonomy of immature insects, phases of biology and ecology of insects. Typewritten report required in some fields. Fall and Spring, 1981-82.

797. Seminar **(1)**
One hour of conference. Assigned reports and discussion of topics in entomology. Fall and Spring, 1981-82.

798. Research Problems in Forest Entomology
(Credit hours arranged according to nature of problem)
Comprehensive report required in some projects. Fall and Spring, 1981-82.

810. Advanced Insect Taxonomy (3)
Two hours of lecture and three hours of laboratory. Methods, procedures, and concepts of systematics. Examples and material will be drawn from among important groups of forest insects. Fall, 1981.
Prerequisites: FEN 580 and FEN 610.

820. Taxonomy of Diptera (3)
One hour of lecture and discussion and six hours of laboratory. Methods and procedures for collecting, preserving, and determining generic and specific identifications of adult and larval flies will be practiced. Problems and concepts of Diptera systematics will be discussed. Fall (even years), 1982.
Prerequisites: FEN 350, FEN 580, FEN 610; FEN 810 suggested.

899. Master's Thesis Research (Credit hours to be arranged)
Research and independent study for the master's degree and thesis. Fall and Spring, 1981-82.

999. Doctoral Thesis Research (Credit hours to be arranged)
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1981-82.

FOR—FORESTRY (RESOURCES MANAGEMENT)

100. Introduction to Forestry and Environmental Management (3)
Two one- and one-half hour meetings. An introduction to environmental and resources management. Emphasis is placed on the breadth of the field and on the important interrelations among the social, physical, and managerial aspects within which the environmental manager operates. Specific topics include: resources, institutions, values, the physical environment, the organism, the biological system, goals, management problems, information and analysis, and dealing with people. Fall, 1981.

300. Summer Program in Field Forestry (6)
Fundamental training in forestry disciplines demonstrating elements of resource inventory, ecology and utilization within the context of total resource management. Course consists of five six-day weeks of field exercises, reports and projects in areas of surveying and cartography, forest and tree measurements, dendrology, ecology, and utilization of forest goods and services. Daily exercises develop understanding through active physical participation by students. Two repeating sessions per summer held at Warrensburg Campus. A service charge is required covering individual expenses while in residence at Pack Demonstration Forest, Warrensburg, New York. Summer, 1982.

321. General Silviculture (3)
Two hours of lecture and one three-hour laboratory first half of semester, three hours of lecture last half of semester. Survey of silvical principles and concepts and practice of silviculture for the production of goods and services from the forest. Designed for students in curricula other than resources management. Not available for resources management majors. Fall, 1981.

322. Introductory Forest Mensuration (3)
Two hours lecture and discussion, one three-hour laboratory. Principles and methods of estimation and measurement of forest trees and products, singularly and in the aggregate; of trees, forest products, forest stands, forest growth in time area and value. Determination by graphical and mathematical analysis of volume, growth, and valuation of wood products and other nonwood products and services of the forest through laboratory problems. Fall, 1981.
Prerequisite: Summer Field Program or permission of the instructor.

331. Introduction to the Physical Environment (6)
Lectures, discussions, field and laboratory work blocked in time and subject matter with FOR 332, Silvics-Silviculture. Study of the environmental media: air, soil, and water, through examination of the flow of energy and matter within and between these components of the environment. Drawing together information from geology, physical geology, soil science, water science and meteorology, this course provides understanding of these areas, their interactions and the interface with the biological system. Fall, 1981.
Prerequisite: Junior year standing in FOR curriculum or equivalent. Course should be taken concurrently with FOR 332, Silvics-Silviculture, because of the blocking of these two courses.

332. Silvics-Silviculture (8)
Three one-hour lectures and five three-hour labs or field trips. Fundamentals of silvics and practices of silviculture enabling manipulation of forests to attain objectives of the forest owner. Emphasis is placed on the biological interrelationships within the forest community, including site factors and forest stand dynamics, and the consideration of these in silvicultural operations. Fall, 1981.
Prerequisites: Summer Program in Field Forestry, and FOR 331 (taken concurrently) or permission of the instructor.

335. Regional Silviculture (3)
Three hours of classroom study. Topics cover regional factors that influence silvicultural methods commonly used in different forest types. Provides study of various silvicultural systems used in operating forest properties in various regions, with attention to geographical differences in land use, market opportunities, species characteristics, and economic conditions. Spring, 1982.
Prerequisite: FOR 332 or FOR 321.

345. Soils (3)
Two hours of lecture and three hours of laboratory. Introduction to the fundamentals of soil science with particular reference to forestry, but including other land uses. Spring, 1982.

351. Meteorology and Fire Behavior (3)
Lectures and recitations in atmospheric physics and the physics and chemistry of combustion lead to discussions of fire behavior and the strategy and tactics of fire suppression. Fall, 1981.
Prerequisites: PHY 103 and 104 (Calculus helpful but not required).

360. Principles of Management (3)
Three hours of lecture and recitation. Basic principles and concepts of management which are universally applicable to any organization, business enterprise, or public agency. The various approaches to management including the classical, behavioral and quantitative concepts with emphasis upon the integrative approach, now required to meet modern society's changing life styles and values and the new awareness of the public regarding environmental matters and natural resources management. Spring, 1982.

364. Soil and Water Conservation (3)
Three hours of lecture. An integrated historical survey of water and related land resource conservation in the United States. Interrelationships of planning, administration, and evaluation of policies, programs and projects by all levels of government and private units. Spring, 1982.

370. Management of the Forest Enterprise (3)
Two hours of lecture and one hour of discussion and laboratory. This course is concerned with the management alternatives, both of a technical and social nature, that are available in the planning for and the production of timber, recreation, wildlife, forage, and water from the forest and with the criteria for choice to meet management objectives. Spring, 1982.

371. Range Management (2)
Two hours of lecture. Range ecology, animal husbandry, management practices and administrative aspects of range resources. Spring, 1982.

372. Planning and Developing Access for Forest Use **(3)**
Two hours of lecture, and one three-hour laboratory and discussion. Planning and developing suitable access necessary in producing a wide range of goods and services derived from forest land. Overland and aerial access systems including costs, consideration of user characteristics, aesthetics, standards, maintenance, and evaluation of alternatives in location and development Fall, 1981.
Prerequisite: Senior standing or permission of the instructor.

373. Timber Harvesting **(3)**
Two hours of lecture and one three-hour laboratory and discussion. Harvesting as a production system including equipment, equipment mixes, costs and manpower in serving and logmaking and primary and secondary transportation. Evaluation of various systems as to environmental impacts. Wood as a raw material to the primary processing system and trees as inputs to the harvesting system. Spring, 1982.

400. The Social Environment of Resource Management **(3)**
Three hours of lecture and discussion. This course describes the institutional framework within which the resource manager practices his profession. It intends to show how economics, law, public policy, pressure groups and financial considerations constrain the professional judgment of the resource manager and the goals and objectives of the institution employing him. Fall, 1981.
Prerequisites: FOR 332, 360, 461, 322 and one hour of computer science; Senior standing.

402. Legal Aspects of Surveying **(3)**
Three hours of lecture and discussion. Fundamental principles of real property law with special reference to boundary survey, conveyances, rules of evidence, title insurance, rights, duties, and liability of professional land surveyors. Case material and appropriate New York State statutes will be discussed. Fall, 1981.

404. Economics of Wood-Using Industries **(3)**
Three hours of lecture and discussion. Structure and organization of selected wood-using industries. Analysis of decisionmaking by the firm. Principles of production and marketing including demand and cost analysis and pricing. Special issues and current problems of the industries, and introduction to the newer mathematical and statistical tools for meeting them. Spring, 1982.
Prerequisite: Microeconomics.

405. World Forestry Resources: Problems and Prospects **(3)**
Three hours of lecture and discussion plus guided readings, pertaining to world forest resources and the problems and opportunities associated with their use and development. Major topics include: world forest resources; production and trade; principal wood-producing countries; forestry and the problems of underdevelopment; and special areas and topics of interest to world forestry. Spring, 1982.
Prerequisite: Senior status preferred.

429. Environmental Impact: Principles and Strategy **(3)**
Three hours of lecture and discussion. Principles and theory of environmental impact and statements of impact as required by federal law. Administrative procedures for review and evaluation. Procedural strategy and effective constitution before various governmental levels. Means of obtaining and sources of authoritative information. Spring, 1982.
Prerequisite: Senior standing.

433. Commodity Production Silviculture **(3)**
Six hours of lecture and study, or field work. Classroom instruction and exercises will introduce topics, followed by field exercises stressing application of silvicultural methods for growing wood products, mostly in hardwood stands. Topics will cover concepts, techniques, diagnostic methods, and field application for thinning, reproduction methods for even- and

uneven-aged stands, assessing site and stand capabilities, and measuring and evaluating stand growth and development following management, where producing wood and other commodities represents a primary goal. Offered one day per week as a block of instruction and exercise. Spring, 1982.

Prerequisites: FOR 331-332, FOR 335, and one mensuration course beyond Summer Program in Field Forestry; Senior standing.

434. Greenspace Silviculture (3)

Two hours of lecture, one to three hours seminar or field trip. Concepts, techniques, and field practice of evaluating and manipulating vegetation systems, including site conditions, woody and herbaceous vegetation, and use impacts, primarily for on-site values in park, recreation, wildlife and multiple-use lands, roadsides, utility rights-of-way, protection areas, etc. Fall, 1981.

Prerequisites: At least one silviculture course and senior status or permission of the instructor.

435. Integrated Use Silviculture (3)

Four hours of lecture and seminar during first half of semester; six hours of field practice thereafter each week. Development of silvicultural decisions in management of woodlands to achieve results under various integrated use objectives. Trips to forest areas. Several technical reports and a cultural plan prepared prescribing treatment to attain various ownership objectives. Spring, 1982.

Prerequisites: FOR 331 and 332 or permission of the instructor. Senior standing.

441. Forest Influences (1-2)

Half time for four weeks. Cranberry Lake Biological Station. Field observation of the effect of the presence of forest vegetation on easily quantified parameters of climate and the hydrologic cycle. Basic measurements of precipitation, radiation, temperature, interception, soil moisture, groundwater, and streamflow. Summer, 1982.

446. Forest Soil Classification, Survey, and Interpretation (3)

Two hours of lecture and discussion, one three-hour laboratory. Detailed examination of soil genesis and classification, and the survey and description of the soilscape. Interpretations are made for various land uses, especially forestry. Spring, 1982.

Prerequisites: FOR 331 or 345 or an introductory soils course.

452. General Meteorology (3)

Three hours of lecture. Examination of the physical processes of the atmosphere as they relate to the exchange of heat, moisture, and momentum in the earth-atmosphere system. Emphasis on the meteorological and micrometeorological basis of climate and its interaction with the biological world. Spring, 1982.

453. Biometeorology (2)

Two hours of lecture and discussion covering the fundamentals of organism-physical environment interaction. Spring, 1982.

455. Forest Tree Improvement (3)

Two hours of lecture, three hours of laboratory or field work. General principles and methods of tree improvement practiced in this country and abroad. Tree selection, techniques of vegetative propagation, hybridization, polyploidy, establishment of seed orchards, clonal and offspring testing and other problems. Spring, 1982.

Prerequisites: FBL 470, or Introduction to Mendelian Genetics or Population Genetics.

456. Management of the Forest Business (3)

Three hours of discussion. Overview of major business management principles and methods of operation in forestry enterprises. Emphasis is on general business concepts which forest managers must use. Actual case studies are basis of instruction. Complementary to RMP 611. Fall or Spring, 1981-82.

461. Management Models (3)
Two hours of lectures, three hours of laboratory. Introduction to the various models used in managerial decisionmaking. Emphasis is on the characteristics of the various models: their formulation, assumptions, uses, and limitations. The major topics covered will include: the role of models in management; simple optimization; constrained optimization; multi-valued choices; time adjustment of value; simulation; and models in nondeliberated decisions. Integration of the deliberative and intuitive models is stressed. Fall, 1981.

464. Applied Communications (3)
Two hours of lecture, three hours of laboratory during first part of course. Major media production project required. Course objective is to acquaint students with the basic principles of instructional communications in the teaching-learning process. Various media including television, motion pictures, exhibits, illustrated lectures, slide talks, newspapers, etc., are examined with emphasis on their utilization in environmental education. Also, consideration is given to instructional design for meeting predetermined learning objectives in various publics—lay and professional adult audiences, school children, etc. Spring, 1982.

465. Managerial Economics (3)
Three hours of lecture and discussion. Analysis of decisionmaking by the firm. Review of principles employed in modeling, predicting, risk assessment, evaluation and selection of alternative actions. Emphasis on economic and financial decisions and on the delineation of systematic processes of decision. Spring, 1982.
Prerequisite: Not available to Resource Management undergraduates except with permission of the instructor.

471. Resources Management (3)
Three hours of lecture/discussion/recitation/case studies. The interrelationships between man and forest land resources and the multiple services which these resources provide; the extent and nature of responsibilities of the resource manager to the community and to society in his stewardship of natural resources. Spring, 1982.

472. Fundamentals of Outdoor Recreation (3)
Three hours of lecture. Introduction to the programs and practices of federal, state, and local agencies and private organizations involved in planning, administration, and management of outdoor recreation areas. Emphasis is on major recreational issues and conflicts faced by area managers, and how they integrate solutions into their plans. Spring, 1982.

473. Planning and Development of Forest Recreation Areas (3)
Three hours of lectures or equivalent laboratory and assignments. Planning and designing forest recreation areas, structures, and facilities. Development of construction plans for camp and picnic sites, for waterfront areas and for trails. Emphasis is on the functional relationship between planning and design, management, and maintenance. Field trips required. Fall, 1981.
Prerequisites: FOR 472 and permission of the instructor.

475. Sociology and Psychology of Leisure Behavior (3)
Three hours of lecture and discussion. Introduction to theory and research findings dealing with the sociological and psychological aspects of leisure behavior; field work and lectures demonstrate applications, particularly with regard to leisure behavior. Spring, 1982.
Prerequisites: FOR 472, and an introductory course in sociology or psychology, or permission of the instructor.

477. Resource Policy and Management (3)
Three hours of lecture supplemented by one hour of discussion and/or lecture. Public and private forest policy formation; principles of modern management; overall management and operation of a productive forest property. Primarily for forest engineers. Not available to Resource Management undergraduates. Fall or Spring, 1981-82.
Prerequisites: Mensuration and silviculture, senior standing in Forest Engineering, or by permission of the instructor.

478. Marketing of Forest Products **(3)**
Three hours of discussion and analysis. Case study analysis of product, pricing and market research policies and problems of market structure in the lumber, pulp and paper and other major wood-using industries. Spring, 1982.

480. Urban Forestry **(3)**
Two hours lecture and three hours of laboratory or field trip. Introduction to urban forestry: its professional status and potentials. Elements of urban physical geography. Nature and functions of various kinds of urban greenspace; their physical and social interactions as an integrated system, and management within the broader context of urban processes. Field practice in evaluating urban greenspace resources. Spring, 1982.
Prerequisites: Senior status. FOR core courses or permission of the instructor. For students in other schools FOR 434 is desirable.

496. Special Topics in Environmental and Resource Management **(1-3)**
Guided readings, lectures, discussions, tutorial conferences, or special coursework designed to help the undergraduate student apply scientific analysis of a social, biological, or physical nature to questions within his area of interest. Questions and analyses would include those dealing with forest resources management and administration; forest cultural practices; land use and land use planning; hydrology and watershed management; outdoor recreation; resource economics; world forestry; and others. Fall and Spring, 1981-82.
Prerequisite: Permission of the instructor.

497. Resources Management Seminar **(3)**
Three hours of group discussion and analysis. Current literature, plans and principles, and new developments in forest management. Fall or Spring, 1981-82.

498. Special Studies in Environmental and Resource Management **(1-3)**
Independent research in environmental and resource management for selected undergraduate students. Selection of subject areas determined by the student in conference with appropriate faculty member. Final written report is required for departmental record. Fall or Spring, 1981-82.
Prerequisite: Permission of the instructor and department chairman.

499. Independent Study in Resources Management **(7-17)**
Independent study of some significant aspect of environmental and resources management. The selection of the topic will be determined by the student in consultation with his advisor. Guidance will be provided by a faculty committee. Limited to Spring semester seniors in Resources Management. Spring, 1982.

FTC—FOREST TECHNOLOGY

200. Dendrology I **(2)**
Twenty-five hours of lecture and 34 hours of field time. A study of the distinguishing characteristics, growth features, distribution, associates and importance of the major tree species of North America. Seasonal field identification and on-the-spot discussion of habitats, associates, and the place in succession of the predominant forest trees and shrubs as found in the Adirondack area of the Northeast, plus a limited number of introduced species. Fall, 1981.

202. Plane Surveying I **(4)**
Fifty-four hours of lecture and 100 hours of field and laboratory time. An introduction to the theory and practice of plane surveying. Emphasis is on individual skill development through small crew projects, handling typical surveying equipment in typical field situations. Lecture topics include the theory of measurements and errors, mathematics for plane surveying, introduction to field problems and introduction to map use and preparation. Field projects include traversing, methods, and proficiency projects in handling typical surveying instruments. Fall, 1981.

203. Plane Surveying II **(1)**

Twelve hours of lecture and 32 hours of field time. A continuation of FTC 202 with emphasis on small crew field projects introducing the use of the engineer's level and the theodolite. Classroom work is directed at explaining the United States Public Land Survey system and introducing the concepts of modern deed descriptions and recordkeeping procedures. A trip to the County Court House is scheduled for a first hand look at a modern deed and record keeping operation. Spring, 1982.

Prerequisite: FTC 202.

204. Forest Mensuration and Statistics I **(3½)**

Sixty-seven hours of lecture and 36 hours of field time. A classroom and field study of the basic principles and skills required for timber measurements. Volume tables, their use and construction are studied. Cruise reports are required in which the student presents cruise results. Various methods of forest sampling are studied including methods of calculating necessary sampling intensities and sampling errors. Fall, 1981.

205. Forest Mensuration and Statistics II **(2)**

Four hours of lecture and 44 hours of field and laboratory time. A field problem of practical nature utilizing methods for collecting, analyzing, and presenting data dealing with timber volumes. Spring, 1982.

Prerequisite: FTC 204.

206. Forest Ecology **(3)**

Forty-two hours of lecture and 50 hours of field time. Study of weather and weather data collection; students manning a forest weather station. Study of weather and soil factors as to how they affect trees and forests, plus the interactions within the forest community and with the environment. Introduction to cover type mapping. Final field problem and report on detailed measurement and analysis of a belt transect. Fall, 1981.

207. Aerial Photogrammetry **(2)**

Twenty hours of lecture and 36 hours of laboratory. Development of the ability to interpret important ground features by viewing aerial photos singly and in pairs, using stereoscopic techniques and equipment. Scale problems and the making of reliable horizontal and vertical measurements. Radial line plot control for the transfer of detail to base maps. Forest type mapping and forest mensuration using photos. Fall, 1981.

208. Forest Installations **(3)**

Thirty-six hours of lecture and 60 hours of field time. This course provides the student with the technical competence necessary to use, plan, construct, and maintain such typical forest improvements as telephone lines, radio systems, trails, and light frame structures. Fall, 1981.

209. Forest Roads **(2)**

Twenty-two hours of lecture and 32 hours of laboratory time. This course provides the student with the technical competence necessary to administer, locate, and design the construction and maintenance of a typical forest gravel road. Spring, 1982.

Prerequisite: FTC 202.

211. Silviculture **(2½)**

Thirty hours of lecture and 40 hours of laboratory and field work blocked with forest management. Lectures based on text study cover orientation, terminology and present a framework of the various treatments used in many common stand conditions to bring the forest into a more productive state in accord with the objectives of management. Emphasis on thinning in computer simulation and field practice. Exercises in planting and pruning. Demonstrations in chemical silviculture. Spring, 1982.

Prerequisite: FTC 206.

212. General Forestry **(1½)**

Thirty-one hours of lecture and two all-day field trips. This course provides an overview of the American forest-based resource, the development of forestry in the United States, Multiple-Use, the functions of government forestry agencies and private industry. Career opportunities for forest technicians are explored. Spring, 1982.

213. Forest Protection I **(2)**
Thirty-eight hours of lecture and 36 hours of laboratory/field time. A study of the insect and disease agents that damage trees and their role in the total forest community. The course covers identification of local forest insects and disease-causing organisms, study of the major pest groups of other forest regions, and control measures including the effects of pesticides on the environment. Field trips cover local pests and the damage caused, while laboratory work covers major groups of pests likely to be encountered elsewhere. Fall, 1981.

214. Personnel Management **(1½)**
Fourteen hours of lecture and 12 hours of laboratory. A study of company and agency organization functions, including selection of and placement of personnel, training of personnel and performance evaluations, planning for and administering crew responsibilities, human relations in the working situation and special personnel problems of the forest are covered. Techniques of foremanship are applied in various field exercises in other courses, along with the duty of safety hazards, accident prevention, accident classification and accident reporting. Spring, 1982.

215. Timber Harvesting **(2)**
Sixteen hours of lecture and 36 hours of field time. This course acquaints the student with the basic harvesting methods and techniques, with emphasis on the Northeast, along with the knowledge of how and where harvesting fits in with other forest uses. Students gain technical competence in timber sale contract administration and basic timber appraising. Spring, 1982.

217. Forest Management **(2½)**
Thirty-six hours of lecture and 40 hours of laboratory and field work blocked with silviculture. Coverage of the common problems met in organizing a forest property to approach the goals of ownership. Study and practice in techniques of growth measurement and the gathering and use of forest records in general. Summary application of pertinent information from many other courses in a work plan involving management decisions for an assigned forestry property. Spring, 1982.
Prerequisite: FTC 206.

218. Forest Recreation **(1½)**
Fifteen hours of lecture and 32 hours of laboratory or field time. This course acquaints the student with the forest recreational resources—its present and future needs. Principles of recreation development and management are discussed with special emphasis placed on the technical aspects. Spring, 1982.

219. Elements of Wildlife Ecology **(1½)**
Twenty-eight hours of lecture and four hours of field time. A study of the principles of wildlife ecology with fundamentals related to the actions of the preservationist, conservationist, and particularly those of the forest manager. Spring, 1982.
Prerequisite: A course in biology or its equivalent.

221. Water Resource Management **(2)**
Twenty-seven hours of lecture and 40 hours of field time. A comprehensive study of the concepts of the hydrologic cycle and quantification of its components. Particular stress on basic water measurements, erosion-sedimentation, and protection of the soil-water resource. Spring, 1982.
Prerequisite: FTC 206; FTC 202.

223. Graphics **(1)**
Twenty-two hours of lecture. An introduction to lettering and drafting with emphasis on the skills needed by the forest or surveying technician. Individual skill development is achieved through several projects. The concept behind each project is explained in handout material and lecture, and each student is then expected to complete the project on his/her own time. Freehand and mechanical lettering plates are produced in addition to precision and pictorial drawings. Fall, 1981.

227. Forest Protection II **(2)**

Twenty-three hours of lecture and 24 hours of field and laboratory time. The basic principles of fire ecology, forest fire behavior, fire danger and fire danger rating, forest fire prevention and control, and prescribed burning are covered. Handtool fire suppression techniques are demonstrated and practiced. Spring, 1982.

Prerequisite: FTC 213.

228. Structure and Growth of Trees **(1½)**

Nineteen hours of lecture and twelve hours of laboratory. A study of the various tissues of forest trees and how their growth and development are affected by internal and external factors. Differences in stem structures of some of the more important commercial tree species of the United States are studied in the laboratory, and these differences are related to the commercial uses of these species. Spring, 1982.

Prerequisite: An introductory course in general botany or biology.

229. Silviculture II **(2)**

Twenty-six hours of lecture and 28 hours of field and laboratory. Continuation of FTC 211 dealing mainly with the handling of the more complex hardwood and mixed stands common to the Northeast. Special coverages will be offered on current practices of regional importance beyond the Northeast where graduates are likely to be employed. Spring, 1982.

230. Plane Surveying III **(2)**

Twenty-six hours of lecture and 28 hours of field time. A continuation of FTC 202 and FTC 203 with emphasis on small crew projects using the theodolite. Advanced field techniques are discussed and practiced, such as the determination of the true meridian by the method of direct solar observation, layout of highway curves and simple triangulation procedures. Each topic is developed in detail in the classroom before each field project is completed. Spring, 1982.

Prerequisites: FTC 202 and FTC 203.

FZO—ZOOLOGY (FOREST ZOOLOGY)

332. Wildlife Conservation **(3)**

Two hours of lecture, one hour of recitation. Introduction to the biological principles of conservation including the relationship of natural resources to modern society. The wildlife resource and its conservation will be emphasized. It is not designed for students concentrating in the area of Forest Wildlife Management. Fall, 1981.

Prerequisite: One semester of biological science.

381. Vertebrate Anatomy, Histology and Physiology I **(4)**

Three hours of lecture, three hours of laboratory. Vertebrate macroanatomy, microanatomy, and physiology with special emphasis on the skeletal, muscle, nerve, and endocrine systems. Fall, 1981.

Prerequisite: General zoology or general biology.

382. Vertebrate Anatomy, Histology and Physiology II **(4)**

Three hours of lecture and three hours of laboratory. Vertebrate macroanatomy, microanatomy, and physiology with special emphasis on digestion, metabolism, nutrition, circulation, respiration, excretion, and body defense and destructive systems. Spring, 1982.

Prerequisite: General zoology or biology.

411. Invertebrate Zoology **(4)**

Three hours of lecture, three hours of laboratory. Structure, function, classification, and evolution of invertebrates. Emphasis on ecological role of invertebrates in specific habitats. Fall, 1981.

413. Biology of Birds and Mammals **(4)**

A course surveying the taxonomy, anatomical-behavioral-physiological adaptations and natural history of birds and mammals. Techniques for the field study of a vertebrate species will be discussed. Fall, 1981.

415. Herpetology **(3)**
Two hours of lecture and three hours of laboratory. An introduction to the structure, function, ecology, behavior, development and distribution of amphibians and reptiles as they relate to the systematics of the various groups. Spring, 1982.

416. Ichthyology **(3)**
Two hours of lecture, three hours of laboratory. An introduction to the anatomy, physiology, ecology, behavior, and taxonomy of fishes. Spring, 1982.

423. Microcommunity Ecology **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. Study of terrestrial invertebrate microcommunities; descriptive and comparative assay of microhabitats incorporating experimental and field techniques. Summer, 1982.

424. Vertebrate Ecology **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. Utilization of unique Adirondack forms and communities to study population dynamics, behavior, systematics, and ecological role of vertebrates; standard field and laboratory techniques. Summer, 1982.

426. Ecology of Adirondack Fishes **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. Study of the ecology of fishes, with detailed individual investigation of the ecology of Adirondack fishes. Summer, 1982.

427. Field Ornithology **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. Field study of the ecology, distribution and behavior of birds of the Adirondack region. Techniques used in conducting field studies in avian biology will be emphasized. Summer, 1982.

440. Fishery Biology **(4)**
Three hours of lecture and three hours of laboratory. Introduction to models of growth, mortality, production, and exploitation; aspects of fish ecology and behavior related to the dynamics and management of fish populations. Fall, 1981.
Prerequisite: FZO 416 or equivalent.

456. Wildlife Ecology and Management **(3)**
Three hours of lecture. A study of the ecological principles governing wild animal populations and their habitats and the relationship of these principles to management programs and decisions. Spring, 1982.
Prerequisites: FBL 320, general ecology or its equivalent.

457. Wildlife Ecology and Management Practicum **(2)**
One hour discussion, three hours laboratory. Practical contact and experience with wildlife management techniques and programs; relates practices to principles of management. Designed for biology students wishing to pursue careers as wildlife biologists. Spring, 1982.
Co-requisite: FZO 456; Pre or co-requisite LIB 300.

470. Principles of Animal Behavior **(3)**
Three hours of lecture. A study of the basic principles of animal behavior, stressing exogenous and endogenous mechanisms of control. Spring, 1982.
Prerequisite: One year of biology.

475. Behavioral Ecology **(2)**
Half-time for four weeks. Cranberry Lake Biological Station. Study of the behavioral adaptations of animals to their environment. Emphasis will be placed on animal orientation and social behavior. Habitat selection and interspecific interactions will also be considered. Credit may not be received for both FZO 475 and FZO 470. Summer, 1982.

520. Terrestrial Community Ecology **(3)**
Three hours of lecture. Relation of terrestrial vertebrates and invertebrates to their physical, chemical, and biological environment. Emphasis on community principles, structural quantification, and evolutionary processes of terrestrial animals. Fall, 1981.
Prerequisite: A course in basic ecology.

553. Wilderness Wildlife Management (2)
Two hours of lecture followed by one hour of group discussion. Students will participate in a two-day field trip at Huntington Forest. Completion of a term paper will be required for graduate credit. Fall, 1981.

620. Invertebrate Symbiosis (3)
Two hours of lecture and one three-hour laboratory. An introduction to the ecology and evolution of interspecific relationships of invertebrates. Spring (even years), 1982.
Prerequisites: FBL 320, FZO 411.

621. Practicum in Terrestrial Community Ecology (1)
Three hours of laboratory. Intensive practical application of ecological principles to the study of terrestrial animal communities. Includes experimental and field collection of data, quantifications, synthesis, and final reporting. Fall, 1981.
Pre- or co-requisite: FZO 520 or equivalent.

622. Ecological Energetics (3)
Two hours of lecture and three hours of laboratory or one hour of discussion. Investigation of the principles of energy flow in biological systems. Emphasizing understanding of energy transformations, energy budgets and energy structures of individual organisms, populations, and ecosystems. Spring, 1982.
Prerequisite: A course in general ecology.

635. Behavioral and Physiological Ecology (3)
Two hours of lecture and one hour of discussion. An examination of the concepts of animal adaptations to ecological change from a behavioral point of view. Particular emphasis will be placed on the role the environment plays in shaping the behavior of a given species. Behavioral and physiological responses to environmental conditions will be treated as a continuum. Spring (odd years), 1983.
Prerequisites: One course in ecology, behavior, and physiology.

650. Biology and Management of Waterfowl (2)
A consideration of the identification, life history, ecology, and economic importance of waterfowl of the Atlantic Flyway. The management of local, flyway, and continental waterfowl populations, including the establishment of hunting seasons, will be discussed. One Saturday field trip. Fall (odd years), 1981.
Prerequisite: Permission of the instructor.

654. Habitat Inventory and Evaluation (3)
Four hours of lecture and discussion. Habitat analysis techniques are dealt with at two levels. Micro or taxon-specific techniques are surveyed and compared. Macro or regional inventory procedures are then examined. Finally, approaches to habitat evaluation are explored. Spring, 1982.
Prerequisites: A course in wildlife management principles and permission of the instructor.

655. Urban Wildlife (2)
Three hours of lecture and discussion with field trips. A study of the occurrence, adaptations, and values of wildlife in urbanized areas, with emphasis on current research and agency programs. Spring, 1982.
Prerequisite: Permission of the instructor.

659. Management of Wildlife Habitats and Populations (4)
Three hours of lecture and three hours of laboratory; two weekend field trips. For graduate students intending to enter the wildlife profession. Focus is on the application of ecological principles and management techniques in the planning of habitat and harvest management programs for wildlife. Extensive independent work required. Fall, 1981.
Prerequisites: FZO 456, FZO 457 or permission of the instructor.

720. Topics in Soil Invertebrate Ecology (3)
Two one-hour lecture and discussion periods and a three-hour laboratory. Study of literature relating to soil invertebrate microcommunities; taxonomy, culturing, and collection methods of soil fauna; student will conduct an individual research problem. Spring (odd years), 1983.

727. Seminar in Aquatic Ecology **(1)**
Two hours of lecture and discussion. A seminar to explore in some depth areas of current research in aquatic ecology. Fall (even years), 1982.
Prerequisite: Six credits in aquatic ecology.

750. Topics in Wildlife Biology **(1-3)**
Hours to be arranged. Group study of a wildlife management topic. Fall or Spring, 1981-82.
Prerequisite: Six credits of wildlife management courses.

797. Forest Zoology Seminar **(1)**
Two hours of discussion and assigned reports on current problems and new developments in forest zoology. Fall and/or Spring, 1981-82.

798. Problems in Forest Zoology **(Credit hours to be arranged)**
Individual study of special problems in forest zoology. One typewritten report (original and one carbon) required. Fall and/or Spring, 1981-82.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1981-82.

970. Topics in Animal Behavior **(2)**
Two hours of lecture and discussion. A seminar-type course designed to explore in depth selected and controversial subject areas in animal behavior. Fall or Spring, 1981-82.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1981-82.

GRA—GRAPHICS (LANDSCAPE ARCHITECTURE)
(See also courses listed under EIN and LSA.)

380. Technical Drawing **(1)**
One three-hour drafting room period. Elements of perspective, isometric, oblique, and orthographic projection. Practice in freehand and instrument drawing. Fall, 1981.

381. Technical Drawing **(2)**
Two three-hour drafting room periods. Elements of perspective, isometric, oblique, and orthographic projection. Practical applications of these principles in machine and architectural drawing, including piping and electrical drawings. Spring, 1982.

382. Graphic Communication **(2)**
Two three-hour studios with up to one hour of studio per week devoted to group presentation meetings, instruction, and review of new techniques such as diagramming, drafting, perspective, and plan graphics. Drawings, examinations, and a final portfolio constitute the basis for grades. Fall, 1981.

482. Advance Media **(1-3)**
Three hours of studio. Discussions, demonstrations, critiques and individual study. Study oriented toward perception and self-expression, use and possibilities of various media, as selected by student and instructor. Fall and Spring, 1981-82.
Prerequisites: Prior art media training or experience and permission of the instructor.

682. Video Communications **(3)**
Three hours of studio plus two hours of lecture. This course will provide students with instruction and experience in the skills necessary to provide video tape programs. Each student will prepare and develop a video script for production of a program on an assigned topic. Completed programs will be tested and evaluated. Class size is limited. Fall or Spring, 1981-82.
Prerequisite: Permission of instructor.

LIB—LIBRARY (COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY COURSE)

300. Library Research (1)
Fifteen hours of class time per semester (usually the first five weeks). Introduction for students at all levels to basic library material and the research process leading to preparation of a bibliography. Fall and Spring, 1981-82.

LSA—LANDSCAPE ARCHITECTURE
(See also courses listed under EIN and GRA.)

320. Introduction to Landscape Architecture and Planning (3)
Three hours of lecture. The course presents an overview of the professions of landscape architecture and planning. It surveys the historic and contemporary situations of environmental design and planning. The course introduces the socio-cultural and natural factors which influence the form and condition of the physical environment. It will introduce issues, personality, and projects. Fall, 1981.

326. Landscape Architecture Design Studio I (3)
Six hours of studio and one hour of lecture. The first in a sequence of studios focusing on the concepts, skills, and methods of design. This course introduces students to the basic vocabulary, concepts, and principles of design; the application and operation of these in the physical environment, development of three-dimensional spatial concepts. The requirements for this course include readings, examinations, field trips, design exercises, and projects. (Student field trip expense $125-150). Fall, 1981.
Prerequisite: Permission of the instructor.

327. Landscape Design Studio II (3)
One hour of lecture and six hours of studio. The second in a sequence of studios focusing on the concepts, skills, and methods of design. This course continued the development of design abilities through study of the interrelationship between the requirements of a design established in a program, the visual character of the site and the development of a designed result. The development of spatial concepts which meet principles of composition organization and a given set of requirements. The requirements for this course include readings, examinations, field trips, design exercises, and projects. (Student field trip expense $125-150). Spring, 1982.
Prerequisites: LSA 326 with a minimum grade of C and GRA 382.

330. Site Research and Analysis (2)
One hour of lecture and three hours of studio. This course will require those enrolled to apply principles of natural resources and processes to assess the land use and development potentials and limitation of a site. The principles will include landforms, soils, hydrology, climate, energy, and plant, animal, and human ecology. A variety of manual and computer techniques for data collection, analysis and synthesis of natural systems information will be explored. The course will concentrate on the comparison of synthesis techniques and their implications for land use and design decisionmaking. Occasional local field trips will be utilized. Spring, 1982.
Prerequisite: EIN 311 or permission of the instructor.

422. Landscape Design Studio III (4)
Twelve hours of studio. This course is a continuation of skill development, theory, and strategies as they relate to design issues and process. Emphasis is placed on in-depth investigation on projects of a direct scale illustrating form derivation and the man-made and natural form. Occasional field trips to illustrate various design solution. Fall, 1981.
Prerequisites: LSA 327 with a minimum grade of C, and LSA 330.

423. Landscape Design Studio IV (4)
Twelve hours of studio. This course emphasizes skill development, theory, and strategy as they relate to large-scale site design situations. Continues prior courses emphasis on design process and form manipulation. Occasional field trips to illustrate and inspect design form. Spring, 1982.
Prerequisite: LSA 422 with a minimum grade of C.

425. Orientation for Experiential Studio **(3)**

Three hours of lecture and recitation. Investigation and documentation of an area of specialty, discussion, readings, and research. Fall and Spring, 1981-82.

Prerequisite: Permission of the instructor.

433. Plant Materials **(2)**

Three hours of lecture and field work for first one-third of semester. Two hours of lecture for second one-third of semester. This course concentrates on woody plant materials used in landscape architecture, the ecological relationships of plants, ornamental plant materials use and identification, plant culture propagation, transplanting, planting plans and specifications. Fall, 1981.

Prerequisite: Permission of instructor.

434. Design Materials **(1)**

Three hours of lecture for last one-third of semester. An introduction to wood, concrete, masonry, asphalt, stone, and synthetic materials intended to provide students with an understanding of the basic visual, structural, and maintenance principles of each, in order to both use the materials in design and prepare written specifications. Fall, 1981.

442. Site Grading **(2)**

Two hours of lecture and three hours of studio during first two-thirds of semester. Lectures, projects, and assigned readings. The study of grading as the primary means of landform modification in landscape architectural design. Primary emphasis will be given to principles of grading, including contour manipulation, sections, profiles, and computations. Concepts of establishing acceptable slopes and positive surface drainage will be introduced. Enrollment limited to BLA or MLA students. Fall, 1981.

Prerequisite: LSA 330, Site Research.

443. Site Drainage Systems **(1)**

Three hours of lecture for last one-third of semester. Lectures, projects, and assigned readings. Provides a basis for the design of drainage systems. Coverage includes concepts relevant to understanding precipitation, methods of run-off quantification, open channel flow, systematic pipe network analysis. Enrollment limited to BLA or MLA students. Fall, 1981.

Prerequisite: LSA 330, Site Research.

444. Vehicular Circulation Design **(1)**

Three hours of lecture for first one-third of semester. Lectures, projects, and assigned readings. Must be taken concurrently with LSA 423. Introduces the circular geometry of horizontal curves and the parabolic geometry of vertical curves, curve coordination based on safety and aesthetic relationships, road grading. Enrollment limited to BLA or MLA students. Spring, 1982.

Prerequisites: Computer Programming and Surveying.

445. Elements of Structures **(1)**

Three hours of lecture during the second one-third of the semester. Lectures, projects, and examinations. An introduction to the concepts of assembling engineering materials into structure. All common building systems will be surveyed and emphasis will be placed on fundamentals rather than on detailed mathematical design procedures.

Prerequisite: Non-School of Landscape Architecture students by permission of the instructor. Not open to engineering majors. Spring, 1982.

455. Professional Practice in Landscape Architecture **(2)**

Two hours of lecture. This course examines the historic and contemporary modes of landscape architectural practice including practice types, ethics, operations, and client systems. Particular emphasis is given to the projected trends of professional practice and with impact on future roles for the landscape architect. Professional development is reviewed as it relates to internship, licensing, and continuing education. Occasional field trips will be utilized. Spring, 1982.

Prerequisites: Senior status in landscape architecture or permission of instructor.

495. Selected Readings in Environmental Studies (1-3)
Exploration of selected readings in depth with individual independent study upon a plan submitted by the student and related to credit hours assigned. Upon approval of the instructor, the student may systematically investigate some subject area encountered in regularly scheduled courses or may initiate research on a variety of subject areas of determined relevance. Fall and Spring, 1981-82.
Prerequisite: Permission of the instructor.

496. Special Topics in Landscape Architecture (1-3)
One to three hours of class meetings. Special topics of current interest to undergraduate students in landscape architecture and related fields. A detailed course subject description will be presented as a topic area is identified and developed. Fall and Spring, 1981-82.
Prerequisite: Permission of the instructor.

498. Introductory Research Problem (1-3)
Guided study of a selection of problems relating to landscape architecture and environmental design. Emphasis on study procedure and methods employed. Enrollment at periodic intervals throughout the semester. Fall and Spring, 1981-82.
Prerequisite: Permission of the instructor.

520. Design Analysis Studio I (3)
Six hours of studio and one hour of lecture-discussion. The first in a sequence of studios focusing on the concepts, skills, and methods of design. This course introduces students to the basic vocabulary of theoretical design principles, to the application and operation of these in the physical environment, and to the development of three-dimensional spatial concepts in community scale patterns. The requirements for the course include readings, examinations, field trips, design exercises, and projects, Fall, 1981.
Prerequisites: First-year MLA standing or permission of the instructor. Not open to BLA students.

521. Design Analysis Studio II (3)
Six hours of studio and one hour of lecture. The second in a sequence of studio applying the concepts,, skills, and methods of design in a critical analysis of various natural and human systems in community scale environments. Concentration is on the evaluation of options in the ordering of a variety of land use activities, with special emphasis on the functional and spatial quality of built environments. The requirements for this course include readings, examinations, field trips, design exercises, and projects. Spring, 1982.
Prerequisites: LSA 520, GRA 382, or permission of the instructor.

522. Landscape Design Studio VI (4)
Twelve hours of studio. Studio problems, research, drafting and field trips. Concentration on complex urban problems. Concern for social and psychological considerations of the individual and large groups of people, their interaction and resultant forms of the environment. Spring, 1982.
Prerequisite: Permission of the instructor.

524. Experiential Landscape Studio Design (16)
Forty-eight hours per week. The articulation of the study proposal established in LSA 425, as approved by faculty, through research, readings, field study with graphic and written documentation, and group discussion. Academic study in an off-campus location in an area of landscape architectural significance, as described and delineated in a student-prepared proposal approved by the faculty. Fall or Spring, 1981-82.
Prerequisites: LSA 425 and LSA 423 with a minimum grade of C.

525. Landscape Design Studio VI (4)
Twelve hours of studio. Investigation of a problem in landscape architecture as proposed by the student and conducted in conjunction with faculty advisor. Spring, 1982.
Prerequisite: Permission of the instructor.

527. Landscape Design Studio VI **(4)**
Twelve hours of studio. Studio problems, research, reports, and field trips. Concentration on regional landscape problems, the techniques of their analysis and derivation of their significance to the practice of landscape design. Spring, 1982.
Prerequisite: Permission of the instructor.

529. The Major Elements of Environmental Design **(3)**
Lectures, readings, discussions, and studios. The course presents an introductory survey of environmental design methods and associated skills and techniques. While studio work is part of the course, no design background is required. Fall, 1981.

533. Plant Materials **(2)**
Field trips and discussion. Ornamental woody plant identification. Observation and sketches of outstanding examples of planting design. Three weeks. Summer, 1982.
Prerequisite: Permission of the instructor.

545. Professional Practice Studio II **(2)**
Three hours of studio, one hour of recitation. Studio problems, research, discussion and recitation sessions on the processes and methods of office practice. Emphasis on all aspects of site development. Spring, 1982.
Prerequisite: Permission of the instructor.

547. Principles of Professional Practice **(2)**
Two hours of lecture. Lectures, assigned readings, reports, cost estimates, specifications, contracts, professional ethics, registration laws, professional practice. Spring, 1982.

595. Selected Readings in Landscape Architecture **(1-3)**
Exploration of selected readings in depth with individual independent study upon a plan submitted by the student and related to credit hours assigned. Upon approval of the instructor, the student may systematically investigate some subject area encountered in regularly scheduled courses or may initiate research on a variety of subject areas of determined relevance. Fall and Spring, 1981-82.
Prerequisite: Fifth-year status or permission of the instructor.

596. Special Topics in Landscape Architecture **(1-3)**
Experimental or special coursework in landscape architecture for graduate and undergraduate students. Subject matter and method of presentation vary from semester to semester. Fall and spring, 1981-82.
Prerequisite: Permission of instructor.

598. Research Problem **(1-3)**
Independent study of selected areas of environmental interest. Emphasis on a self-disciplined study, development of procedures and techniques to be employed in environmental design and planning. Engagement with specific sites and problems as proposed for study by individual communities. Enrollment at periodic intervals throughout the semester. Fall and Spring, 1981-82.
Prerequisite: Permission of the instructor.

620. Community Design and Planning Studio I **(4)**
Nine hours of studio and one hour of seminar. An investigation of community design and planning problems related, in part, to undeveloped land. Emphasis is on the process of community design and planning: problem definition, identification of goals and objectives, development of alternative solutions, evaluation, and implementation. Includes application of methods and techniques to specific problems. Fall, 1981.
Prerequisites: Second-year MLA standing or permission of the instructor.

621. Community Design and Planning Studio II **(4)**
Nine hours of studio and one hour of seminar. An investigation of community design and planning problems involving existing built and open space land. Emphasis is on the process of community design and planning: problem definition, identification of goals and objectives, development of methods and techniques to specific problems. Spring, 1982.
Prerequisites: Second-year MLA standing or permission of the instructor.

641. Formal Organizations **(1)**
Three hours of lecture-discussion for one-third of semester. This course presents basic functional concepts of formal organizations for landscape architects who intend to work at the community scale. Three types of organization arenas are presented: private, public, and non-profit organizational characteristics of division of work, hierarchy, authority, and communications are introduced. Comparisons are made between traditional bureaucracies and interdisciplinary teams. Each student will prepare an organizational description. Fall or Spring, 1981-82.
Prerequisites: MLA status or permission of the instructor.

642. Project and Program Scheduling **(1)**
Three hours of lecture-discussion for one-third of semester. The course presents an introduction to alternative scheduling methods for design projects, including bar charts, critical path, and program evaluation review techniques. Fall or Spring, 1981-82.
Prerequisites: MLA status or permission of the instructor.

643. Ethical Issues in Community Design and Planning **(1)**
Three hours of lecture-discussion for one-third of a semester. Status and role of the profession in society, standards of professional conduct and responsibility, ethical responses to a variety of professional situations is the focus of the course. Fall or Spring, 1981-82.
Prerequisites: MLA status or permission of the instructor.

650. Behavioral Factors of Community Design **(3)**
Three hours of lecture and discussion. An introduction to the contribution of the behavioral sciences to community design and planning is provided. Readings and discussions concern both theoretical and methodological aspects. Case studies are used to illustrate a variety of current behavioral science applications. Course assignments to familiarize the student with basic behavioral science methods including questionnaires, observations, and interviews. A final project provides an opportunity to synthesize course materials. Fall, 1981.
Prerequisites: MLA status or permission of the instructor.

651. Process of Urban/Regional Planning **(3)**
Three hours of seminar. The purpose of this course is the introduction of planning as a process of decisionmaking and to familiarize graduate students with its scope and content. The course relies upon lectures and readings to develop introductory knowledge as well as seminars and discussions to cover the constitutional basis, tools, and techniques and the current directions of planning. Spring, 1982.
Prerequisite: Permission of the instructor.

653. Environmental Land Use Planning **(3)**
An introduction to the interdisciplinary techniques and emphasis on environmental land use planning. Consideration of the underlying ecological and planning philosophies. Readings and discussions are used in order to familiarize students with the disciplines involved and the process of data analysis, synthesis, and plan formulation. Case studies and research projects used to enhance understanding. Fall and Spring, 1981-82.
Prerequisite: Permission of the instructor.

656. Environmental Factors, Community Response, and Form **(3)**
Two and one-half hours of lecture and six studios per semester. The course presents an introduction to a comprehensive process for the integration of environmental phenomena, such as solar access, visual access, noise, and wind into community design. The process includes data gathering and analysis, prediction methods, objective criteria, and implementation. Fall, 1981.
Prerequisites: Second year MLA status, or permission of the instructor.

671. History of Landscape Architecture **(3)**
Three hours of lecture-seminar. Regular use of slides and other projected lecture material; assigned texts as a basis for lecture; supplemental readings, assigned and individually researched; class discussion from readings and lecture; and student presentations and term paper. Historical study and style analysis of Western man's efforts to design his environment and his changing attitudes and relationships to environment. Also, non-Western coverage where

significant or influential on Western man. Study of historical personalities as well as periods that are of environmental concern up into the modern periods. Fall, 1981.
Prerequisites: MLA standing or permission of the instructor.

696. Special Topics in Landscape Architecture (1-3)
Experimental or special coursework in landscape architecture for graduate and undergraduate students. Subject matter and method of presentation vary from semester to semester. Fall and spring, 1981-82.
Prerequisite: Permission of instructor.

697. Topics and Issues of Community Design and Planning (2)
Two hours of lecture and discussion. Topics for discussion are selected to acquaint the entering graduate student with a generalized view of current issues facing landscape architects in community design and planning. Readings and papers are regularly assigned. Fall, 1981.
Prerequisites: MLA students or permission of instructor.

699. Research Methods and Techniques (3)
Three hours of lecture. The course examines the design and development of research problems pertinent to landscape architecture and environmental planning. The course will concentrate on three major areas: (1) Areas of Potential Research, (2) Research Methods and Techniques, and (3) Proposal Writing. A variety of approaches to research in human-environment interactions will be discussed and explored with reference to their relevance and applicability to graduate research. Spring, 1982.
Prerequisite: Permission of the instructor.

731. Plant Materials (3)
Seminars, individual conferences, field trips, readings. Guided individual study in aspects of plant materials related to landscape architecture. Fall or Spring, 1981-82.
Prerequisite: Permission of the instructor.

752. Urban and Regional System Dynamics (3)
Lectures and workshop. The major concerns of this course are application of system dynamics; basic principles of system dynamics; and system dynamics modeling. This method is investigated as a useful tool in modeling many landscape architectural and planning problems. No prior computer experience is necessary. Fall, 1981.
Prerequisite: Permission of the instructor.

757. Methods of Corridor Location (3)
Three hours of lecture. This course emphasizes study of corridor types, traditional economic determinism, and the emergence of environmental, aesthetic, and social concerns. Landscape architectural methods for corridor location and evaluation are reviewed and compared. These methods include graphic overlays, an automated data bank, unified scoring systems, and multiple accounts. Students will engage a course project. Spring, 1982.
Prerequisite: Permission of the instructor.

796. Special Topics in Landscape Architecture (1-3)
One to three hours of class meetings. Special topics of current interest to graduate students in landscape architecture and related fields. A detailed course subject description will be presented as a topic area is identified and developed. Fall and Spring, 1981-82.
Prerequisite: Permission of the instructor.

797. Seminar (2)
Two hours of seminar. Discussion of current topics, trends, and, research related to landscape architecture, planning, and management. Fall and Spring, 1981-82.
Prerequisite: Permission of the instructor.

798. Research Problem
(Credit hours to be arranged according to nature of problem)
Special study of assigned problems relating to landscape architecture or planning, with emphasis on critical thinking. Fall and Spring, 1981-82.
Prerequisite: Permission of the instructor.

799. Thesis Project Proposal Development **(1)**
One hour of lecture and workshop. During this course, a student will prepare a proposal for a thesis/project in the MLA program. Fall, 1981.
Prerequisites: LSA 699 and permission of the instructor.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1981-82.

PSE—PAPER SCIENCE AND ENGINEERING

300. Introduction to Papermaking **(3)**
Three hours of lecture. Historical and commercial consideration of the paper industry. Technology of papermaking with emphasis on stock furnish, stock preparation and paper machine operation. Introductory discussions of papermaking materials and formation and reactions of a fibrous web. Fall, 1981.

301. Pulp and Paper Processes **(3)**
Three hours of lecture. Technological consideration of pulping and bleaching of woody raw material. Includes consideration of wood procurement and preparation, pulping and bleaching processes, recovery of secondary fibers, pollution abatement and other ancillary operations. Spring, 1982.
Prerequisites: FCH 475 and 476, PSE 300 (or concurrent).

302. Pulp and Paper Processes Laboratory **(1)**
One three-hour laboratory. Study and practice in the techniques of laboratory procedures normally encountered in the pulp and paper industry. Laboratory exercises selecting and using standard testing methods. Field trips to observe commercial equipment of the pulp and paper industry. Spring, 1982.
Prerequisite: PSE 301 (or concurrent).

304. Mill Experience **(2)**
Twelve weeks full-time pulp or paper mill employment approved by the department between the junior and senior years. The student must submit a comprehensive report to fulfill this requirement. Summer, 1982.

370. Principles of Mass and Energy Balance **(3)**
Three hours of lecture. Conservation of mass and energy applied to steady-state and dynamic process units and systems. Problem analysis and solution; computational techniques. Thermodynamic data and their use; real vs. perfect gases; steam properties; psychrometry. Fall, 1981.
Prerequisites: Calculus, physics, and FCH 360 (or concurrent).

371. Fluid Mechanics **(3)**
Three hours of lecture and/or demonstrations. The study of momentum transfer. Steady and unsteady flow of liquids and gases in pipelines, ducts, open channels, and porous media. Movement of particles in fluid media. Newtonian and non-Newtonian flow and flow of suspensions. Filtration, sedimentation, centrifugation, agitation and mixing. Characteristics and selection of pumps, blowers, agitators and other equipment. Flow measurement and flow system design with economic considerations. Fall, 1981.
Prerequisites: College level physics and chemistry, calculus.

372. Heat Transfer **(2)**
Two hours of lecture and/or demonstration. The study of heat transfer including conduction, convection, radiation and their applications in industry. Heater and heat exchanger design and selection, and industrial evaporation. Spring, 1982.
Prerequisites: PSE 370 and 371 or equivalent.

461. Pulping Technology **(3)**
One hour of lecture and six hours of laboratory. Discussion of pulping and bleaching processes: effect of chemical and physical variables on the wood components and pulp properties; chemistry involved. Experiments in pulping and bleaching, and pulp evaluation. Fall, 1981.
Prerequisites: PSE 301, CHE 346 and CHE 356.
Note: A student may not enroll in or receive credit for both PSE 461 and ERE 671.

465. Paper Properties **(4)**
Three hours of lecture, three hours of laboratory and discussion. Evaluation and study of the physical, optical, and chemical properties of paper and the interrelationships existing between paper manufacturing methods, papermaking additives, test results and the ultimate properties desired in the finished paper. Fall, 1981.
Prerequisites: PSE 301 and PSE 302.
Note: A student may not enroll in or receive credit for both PSE 465 and ERE 677.

466. Paper Coating and Converting **(2)**
One hour of lecture and three hours of laboratory. Evaluation and study of various coating materials and processes used by the paper industry. Introduction to polymers and their use in converting operations. Study of materials and equipment used in converting operations, fundamentals and parameters which control their use, effects on final properties of papers. Spring, 1982.
Prerequisite: PSE 465.
Note: A student may not enroll in or receive credit for both PSE 466 and ERE 678.

468. Papermaking Processes **(3)**
One hour of lecture and six hours of laboratory. Laboratory study of the papermaking process, with emphasis on operation of the semicommercial Fourdrinier paper machine. Emphasis is on the fundamentals of stock preparation, paper machine operation, evaluation of the finished product and the collection and analysis of data to develop material and energy balance. Results of each paper machine run are evaluated in seminar-type discussions. Spring, 1982.
Prerequisites: PSE 461 and PSE 465.

473. Mass Transfer **(3)**
Three hours of lecture. The study of mass transfer, humidification, air conditioning, drying, gas absorption, distillation, leaching, washing, and extraction. Fall, 1981.
Prerequisites: PSE 370, 371, and 372 or equivalent.

491. Paper Science and Engineering Project I **(1)**
Student makes a systematic survey of all available literature on the problem assigned him and incorporates it in a formal, typewritten report. An essential part of this report is a detailed outline of a research project which the student proposes to undertake during the next semester (PSE 492). Fall, 1981.
Prerequisites: PSE 300 and PSE 301.

492. Paper Science and Engineering Project II **(3)**
The analysis of a problem, the synthesis of a solution and the basic design of the facilities needed to solve a problem. Laboratory research, field work, and consulting as needed in addition to the literature survey completed in PSE 491. Progress reports and a final report and seminar-style presentation. Spring, 1982.
Prerequisite: PSE 491.

496. Special Topics **(1-3)**
Lectures, conferences, and discussions. Specialized topics in chemistry, chemical engineering, and physics as well as topics pertaining to management as related to the pulp, paper, paperboard, and allied industries. Fall and Spring, 1981-82.

498. Research Problem (1-4)
The student is assigned a research problem in pulping, bleaching, refining, additives, quality control of paper or paper products, or chemical engineering. The student must make a systematic survey of available literature on the assigned problem. Emphasis is on application of correct research technique rather than on the results of commercial importance. The information obtained from the literature survey, along with the data developed as a result of the investigation, is to be presented as a technical report. Fall and Spring, 1981-82.
Prerequisites: PSE 461 and PSE 465.

RMP—RESOURCE MANAGEMENT AND POLICY

562. International Timber Trade (3)
Three hours of lecture. Basic principles of international trade. Structure and procedures of International timber trade. Major trade regions and their relationships. Economic context of timber trade. Emphasis is placed upon methods of analyses for understanding both opportunities and limitations of timber products exports and imports. Fall, 1981.
Prerequisites: Two semesters of undergraduate economics, and senior standing in forestry or wood products engineering.

587. Environmental Law (3)
Three hours of lecture and discussion. Studies in Environmental Law designed for resource managers. Review of structure and processes of American legal system, constitutional framework of environmental law, The National Environmental Policy Act, legal framework for management of federal lands, focus on legal aspects of common property resource management, land, water, and air. Fall or Spring, 1981-82.

588. The Law of Natural Resource Administration (3)
Three hours of lecture and discussion. An introduction to the law concerning the procedures, powers, and judicial review of public agencies responsible for the management of natural resources. Topics will include the extent of an agency's rule-making power and the rights of aggrieved parties to appeal from agency decisions. Spring, 1982.
Prerequisite: FOR 360 or equivalent course in public administration.

601. Resource Management Systems (3)
Three hours of lecture and seminar. Review of the structure and operation of the ecological and social environment within which resource managers operate. Major characteristics of the ecological utilization and control systems for forest and related natural resources are described and compared. Fall, 1981.

602. Resource Economics (3)
Three hours of lecture and discussion. Economic theory and analysis in resource management and use decisions. Study and application of economic models to land, water, forest, wildlife, and recreational resources. Relationships and interactions of public and private sector in resource management. Fall, 1981.
Prerequisite: Two semesters of undergraduate economics.

603. Research Methods in Resource Management and Policy (3)
Three hours of lecture and discussion. Study of the elements of research methodology including statistics and their application to analyzing and resolving problems both basic and applied in the managerial and policy sciences. Fall, 1981.
Prerequisite: Undergraduate statistics course.

611. Economics of the Forest Business (3)
Two hours of lecture and three hours of laboratory. Economic evaluation of alternative uses of land, labor, and capital in the operation of forest properties and related marketing and processing enterprises. Emphasis is on application of principles and methods of economic analysis. Part of the term is spent in appraising a forest property and preparing a plan for its operation. Complementary to instruction in FOR 456. Spring, 1982.
Prerequisite: Permission of the instructor.

629. Environmental Impact: Principles and Strategies (3)
Three hours of lecture and discussion. Principles and theory of environmental impact and statements of impact as required by federal law. Administrative procedures for review and evaluation. Procedural strategy and effective constitution of statements for various governmental levels. Means of obtaining sources of authoritative information. Fall and Spring, 1981-82.

642. Water Quality Management (3)
Three hours of lecture and seminar. The review of the ethical, historical, legal, and technical basis for water quality management. Investigation of public policy on the international, federal, state, and local levels and the administrative methods and programs used to implement policy. Fall, 1981.

643. Urban Water Management (3)
Three hours of lecture and seminar. A review of the role of urban water management in water resources management. The problems and issues of providing water utilities services of water supply, drainage, and waste water facilities including such considerations as planning, financing, local government, intergovernmental relations, state and federal role, water institutions and applicable law. Spring, 1982.

650. Forestry and Economic Development (3)
Three hours of lecture and discussion. Study of the role of forest resources in the process of economic development. Characteristics of forest resources which are important for economic development are analyzed in detail. Interrelationships between biological, technological, and institutional factors are stressed. Fall, 1981.

662. Land Use Economics (3)
Three hours of lecture and discussion. Study of the theory and methods of land use economics and the application of economic analysis to open space and regional planning. Emphasis is on understanding basic concepts, developing of operational methods and data sources. Case studies, outside readings, and guest speakers are utilized. Fall, 1981.
Prerequisites: One course in macroeconomics and one in microeconomics and permission of the instructor.

664. Soil and Water Conservation (3)
Three hours of lecture and discussion. An integrated examination of the many aspects of the field of water and related land resource conservation in the United States. Topics include the evaluation and present status of planning, organizational, economic and legal constraints on the development of policies and programs of the federal agencies, state and local government and private units. Fall, 1981.
Prerequisite: Permission of the instructor.

670. Economics of Nonmarket Goods (3)
Group discussion, lectures, guided readings, case studies, and student projects on the economic aspects of watershed management, fish and wildlife management, and outdoor recreation. Major topics include theories of valuation and application to nonmarket goods, cost analysis for nonmarket goods, and measurement of regional impacts. Spring, 1982.
Prerequisites: Microeconomics, knowledge of basic statistical analysis, and six hours or more of resource management coursework.

672. Open Space Planning (Recreation) (3)
Three hours of lecture and discussion. Study of methods and techniques applicable to open space planning in nonurban areas. Survey of literature and current research. Open space standards, classification systems, and inventory methods. Development of plans for large scale recreation areas, and inclusion of recreation into regional plans. The interrelationship and conflicts between resource utilization/development and recreation/aesthetics reviewed through case studies. Fall, 1981.
Prerequisites: One course in outdoor recreation, one course in planning, and permission of the instructor.

675. Psychology of Leisure Behavior (3)
Three hours of lecture and discussion. Introduction to theory and research findings dealing with the sociological and psychological aspects of leisure behavior: field work and lectures demonstrate applications, particularly in outdoor recreation. Spring, 1982.

751. World Forestry (3)
Three hours of lecture and discussion. World forest distribution and types; regional production and consumption of forest products; international trade in timber and related products; the role of forest resources in development; and special topics; tropical forestry, comparative forest policies and programs, forestry education, the problems of developing countries, international cooperation in forestry development, the role of the United States in world forestry, etc. Fall or Spring, 1981-82.

753. Resources Policy (3)
Three hours of lecture and seminar. Evaluation of basic environmental and resource issues and their evolvement in public and institutional policies. Exploration of alternative resource goals, policies, and program approaches and their implications. Analysis of processes for policy delineation and modification. Spring, 1982.

754. Advanced Forest Administration (3)
Critical appraisal of existing public, semipublic and private forestry agencies in the United States, and the comparative study of major administrative organizations and practices. Occasional inspection trips to forestry headquarters and field units and discussion of internal administrative problems with forest officers. Fall or Spring, 1981-82.
Prerequisite: FOR 360 or equivalent.

797. Seminar (1)
Group discussion and individual conference concerning current topics, trends, and research in management. Fall and Spring, 1981-82.

798. Research Problems in Resources Management and Policy (Credit hours arranged according to nature of problem)
Special investigation and analysis of resources management problems where integrative relationships of several subject aspects of forestry are a major consideration. Fall and Spring, 1981-82.

898. Professional Experience (1-12)
Professional experience which applies, enriches, and/or complements formal coursework. Graded on an "S/U" basis. Fall, spring, and summer, 1981-82.

899. Master's Thesis Research (Credit hours to be arranged)
Research and independent study for the master's degree and thesis. Fall and Spring, 1981-82.

999. Doctoral Thesis Research (Credit hours to be arranged)
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1981-82.

SCE—SCHOOL OF CONTINUING EDUCATION

510. Creative Problem Solving Seminar (3)
Three hours of lecture and discussion. A course designed to extend the students' understanding and application of creative problem solving processes. One requirement will be to select and carry out an application of the techniques to a particular problem, with consultation and guidance from the instructor. Critique and survey of the literature on creativity, in-depth anaylsis of the synetics process and various procedures which have been developed for nurturing creative behavior comprise the essence of the program. Fall, 1981.
Prerequisite: Undergraduate degree or permission of the instructor.
Note: Also listed as EIN 510.

530. (FEN) Pest Identification, Biology and Management (3)
A study of the life history and management practices for pests common to the home, landscape and recreational areas. Suggested for pest control personnel and teachers of primary and secondary science areas. Not open to College of Environmental Science and Forestry students. Summer, 1982.
Prerequisite: One course in biology.

576. Special Topics Course: Environmental Education Processes and Strategies (3)
Lectures, discussions, field problems, and structured outdoor laboratory assignments in environmental education processes and strategies for professional educators in elementary and secondary schools who are part-time, nonmatriculated at ESF. Summer, 1982.
Prerequisite: Permission of the instructor. Not acceptable for credit in graduate programs of the School of Forestry.

596. Special Topics in Resource Management (1-3)
Lectures, field exercises, guided readings and discussions, in a shortcourse format. The study of recent developments and applications in resource management. Illustrative topics include management of forest stands, resource economics, land planning or recreation planning and site development. Not acceptable for credit in graduate programs of the School of Forestry. Summer, 1982.
Prerequisite: Permission of the instructor.

SIL—SILVICULTURE

520. Application of Ecology (3)
Two hours of lecture and discussion and one to three hours seminar, workshop, or field trip. Exploration of use and implications of ecological concepts for practices modifying terrestrial ecosystems for human benefit. Discussion of ecological writings in relation to applied problems; workshops, field trips and student presentations exploring ecological implications of specific situations. Course designed for interdisciplinary participation. Spring, 1982.
Prerequisite: An ecology course or permission of the instructor.

540. Forest Hydrology (3)
Two hours of lecture and three hours of laboratory. The relation of forest and range vegetation to its environment, and its effect upon soil and water. Measurement of precipitation, runoff, erosion, and other variables. Fall and Spring, 1981-82.

542. Practice of Watershed Management (3)
Two hours of lecture and three hours of laboratory. The impact of the multiple use of forest and range lands on water yield and soil stability. Regional problems and potential solutions. Spring, 1982.
Prerequisite: SIL 540.

553. Energy Exchange at the Earth's Surface (3)
Two hours of lecture and three hours of laboratory. A comprehensive study of the physical processes taking place in the lowest layer of the atmosphere. Primary emphasis on the turbulent transfer of heat, momentum, and water vapor and the expression of these fluxes in the microclimate. Spring, 1982.
Prerequisites: FOR 452, physics, and calculus.

620. Silvicultural Concepts and Applications (3)
Six hours of lecture, study, or field work. Classroom instruction and exercises introduce topics important to silvicultural practice. Students explore these in depth through independent study and the solving of assigned problems. Field exercises will serve as a means to apply concepts, primarily in hardwood stands. Topics include concepts, techniques, diagnostic methods, and formulation and application of silvicultural prescriptions. Offered one day per week as a block of instruction. Spring, 1982.
Prerequisite: Previous undergraduate study of silviculture.

625. Productivity of Forest Stands (3)
Examination of forest tree and stand production variables as related to silvicultural manipulation. Analysis of stand response, such as rate of growth, stem form, product quality, tree quality, and value. Preparation of stand treatment schedules. Spring, 1982.
Prerequisite: Permission of the instructor.

635. Forest Soils and Their Analyses (3)
One hour of lecture, one hour of recitation, four hours of field and laboratory study of forest soils, emphasizing plant-soil relationships. Stress on quantification of plant-soil diagnostic techniques and their interpretation. Fall, 1981.
Prerequisites: FOR 446; background in physical and biological sciences recommended.

640. Advanced Wildland Hydrology (3)
Lecture, discussion, and laboratory sessions in advanced problems of forest and range hydrology, watershed management methods, and techniques and evaluation of new methods of hydrologic data collection and analysis. Fall, 1981.
Prerequisite: SIL 540 or FEG 340.

641. Watershed Analysis (3)
One hour of lecture and six hours of laboratory. Lecture and field experience in watershed characterization, inventory, and analysis in terms of land management problems. Fall, 1981.
Prerequisites: SIL 540 and permission of the instructor.

642. Snow Hydrology (3)
Three one-hour lectures and two three-day field trips. Physical characteristics of snow and the energy relations important in its accumulation and dissipation. Problems of measurement and prediction of runoff and melt. Potentials for management. Spring, 1982.
Prerequisite: SIL 540 or FEG 340.

677. Advanced Forest Tree Improvement (3)
Two hours of lecture and discussion and three hours of laboratory. A study of advanced principles and techniques for genetic improvement of forest trees. Special emphasis is placed on selection and breeding for growth rates, wood quality, and insect and disease resistance. Problems of tree hybridization, racial variations, sexual reproduction, and quantitative genetics in forest trees. Laboratory training in cytology and cytogenetics, pollen germination, vegetative propagation and other problems. Independent research problems will be undertaken by the student. Fall or Spring, 1981-82.
Prerequisites: FBL 470 and 471, FOR 455.

730. Research Methods in Silviculture (3)
Three hours of lecture or discussion. Research concepts and methodology with particular application to silviculture and its related sciences. More appropriate to beginning students or before taking thesis work. Fall, 1981.
Prerequisite: Permission of the instructor.

735. Forest Soil Fertility (Applied Studies) (2-4)
Two hours of lecture and one hour of discussion. Up to six hours of laboratory depending on number of credit hours. Influence of soil fertility on development and growth of seedlings and trees, and techniques involved to determine this influence. Chemical and biological analysis to determine levels of soil fertility. Nutrient element deficiencies and their correction by soil amendments and fertilizers. Term projects by the student will be undertaken. Spring, 1982.
Prerequisites: CHE 332 and 333, FBO 530, FOR 446 and SIL 635, or equivalent.

737. Forest Soil Physics (4)
Three hours of lecture and discussion and three hours of laboratory. Presentation of principles of soil physics including water flow, storage and availability, soil permeability, heat transfer, and their consideration as root environmental factors. Analytical procedures are introduced and evaluated. Applications of soil physics to silvics, soil fertility, watershed management and hydrology, soil biology and land-use. Spring, 1982.
Prerequisites: FOR 345, 446, or their equivalents. Physical chemistry and integral calculus strongly recommended.

777. Quantitative Genetics in Forest Tree Improvement **(3)**
Two-hours of lecture and discussion and three hours laboratory. Development of statistical models for determining heritability in forest trees. Breeding models and computer analysis application in forest genetics. Fall or Spring, 1981-82.

796. Special Topics in Silviculture **(1-3)**
Lectures, seminars, and discussion. Advanced topics in silviculture. Check schedules of classes for details of subject matter. Fall and/or Spring, 1981-82.

797. Graduate Silviculture Seminar **(1)**
Three-hour class discussion. Assigned reports and discussion of silvicultural topics. Fall and Spring, 1981-82.

798. Research Problems in Silviculture
(Credit hours arranged according to nature of problem)
Fall and Spring, 1981-82.

899. Master's Thesis Research **(Credit hours to be arranged)**
Research and independent study for the master's degree and thesis. Fall and Spring, 1981-82.

999. Doctoral Thesis Research **(Credit hours to be arranged)**
Research and independent study for the doctoral degree and dissertation. Fall and Spring, 1981-82.

WPE—WOOD PRODUCTS ENGINEERING

300. Properties of Wood for Designers **(2)**
Two hours of lecture. An introduction to the basic structure and properties of wood for the designer. Discussion of the effects of wood structure and properties on practical woodworking techniques. Fall and/or Spring, 1981-82.

320. Polymeric Adhesives and Coatings **(2)**
Two hours of lecture. An introduction to adhesives, sealants, and coatings used in the wood products and building construction industries. All three types of materials, based upon polymers, will be evaluated in terms of their properties and respective technologies when used with wood systems. Emphasis will be placed on knowing how to apply this knowledge to understand current practice and to solve problems that may occur. Fall, 1981.

321. Adhesives and Coatings Laboratory **(1)**
Three hours of laboratory. Laboratory experiments to identify materials, methods of application, and methods of evaluation of adhesives and coatings normally used in the wood industry. Fall, 1981.
Prerequisites: WPE 320 (may be concurrent) or permission of the instructor.

322. Mechanical Processing **(3)**
Two hours of lecture and three hours of laboratory. Primary log reduction methods and industry practices. Lumber grading. Wood cutting principles. Machining practice in secondary wood-using industries. Experience in the operation of certain primary and secondary machining equipment. Fall, 1981.

326. Fluid Treatments **(2)**
Two hours of lecture. An introduction to wood-moisture relationships, wood permeability and pressure treatments, thermal conductivity, water-vapor movement, and drying and fire retardancy. The flow of fluids, heat and water vapor are treated as analogous phenomena and are related to the cellular structure of wood. Unsteady-state flow of gases, heat and water vapor are introduced. Spring, 1982.

327. Fluid Treatments Laboratory (1)
Three hours of laboratory. Laboratory studies in relative humidity measurement, wood-moisture relationships, the relationship between permeability and treatability, wood-preservative treatments, wood drying and flame testing. Spring, 1982.
Prerequisite: WPE 326 (or concurrent).

343. Introduction to Structural Design (3)
Three hours of lecture. The concepts of structural design are introduced with fundamental strength of materials. There are practical applications of steel, timber, and concrete in contemporary structural designs. Systems such as trusses, arches, and frames are introduced. Spring, 1982.

361. Engineering Mechanics—Statics (3)
Three hours of lecture. Forces and vectors, moments, equivalent force systems, free bodies, structures, section properties. Fall, 1981.
Prerequisites: Integral calculus and general physics.

386. Structure and Properties of Wood (3)
Two hours of lecture and three hours of laboratory. Structure of wood in relation to defects, properties and uses. The variability of wood. Identification of major U.S. timber by gross features. Spring, 1982.

387. Wood Structure and Properties (3)
Three hours of lecture. Structure of wood and its relation to physical properties and uses. The normal variability of wood, abnormal growth, defects, deterioration of wood and their influence on properties and uses. Fall, 1981.
Prerequisite: FBO 300 or equivalent is recommended.

389. Wood Identification Laboratory (1)
Three hours of laboratory. Identification of principal commercial timbers of United States on gross characteristics. Spring, 1982.
Prerequisite: WPE 387.

390. Fiber Identification Laboratory (1)
Three hours of laboratory. Identification of woody and nonwoody papermaking fibers. Spring, 1982.
Prerequisite: WPE 387.

399. Field Trip (2)
Two weeks supervised study and reporting of representative wood products industries. Required of all students in WPE. Estimated individual expenses are $200-250 while on the trip. Spring, 1982.

400. Introduction to Forest Products (2)
Two hours of lecture. Characteristics of the products of the forest tree and manufacture of wood products. Fall or Spring, 1981-82.

422. Composite Materials (3)
Two hours of lecture and three hours of laboratory. Manufacturing methods, physical and mechanical properties, and major uses of each of the following products will be examined—decorative plywood, construction and industrial plywood, particleboards, waferboards, fiberboards, laminated beams, laminated-veneer lumber, wood polymer composites, and paper overlays. Laboratory exercises will be patterned after ASTM standard tests to evaluate the physical and mechanical properties of these materials with written reports to be submitted by each student. Spring, 1982.
Prerequisites: WPE 320. Concurrent or prior registration in ERE 362.

442. Light Construction **(3)**
Two hours of lecture and two hours of discussion. Elements of light frame construction, blueprint reading, and estimating. Fall, 1981.

444. Materials Marketing **(3)**
Three hours of lecture and discussion. Marketing functions, agencies and management in the wood products and related industries. Principles of salesmanship and their application. Spring, 1982.

450. Construction Equipment **(3)**
Three hours of lecture. Principles of selection, operation, and maintenance of construction equipment. Primary types of site preparation, handling and assembly devices and their efficient utilization will be examined. Spring, 1982.
Prerequisite: Senior standing.

454. Construction Management **(3)**
Three hours of lecture. Fundamental concepts of construction management activities. Topics include construction contracts, scheduling, project planning, estimating and bidding. Fall, 1981.
Prerequisite: OPM 365 or permission of instructor.

497. Senior Seminar for Wood Products Engineering Majors **(2)**
Discussion and assigned reports in current problems and new developments in Wood Products Engineering. Fall, 1981.

498. Research or Design Problem **(1-3)**
Conferences, library, laboratory and/or field research on a specific problem in Wood Products Engineering. Typewritten report (original and one copy) required. Fall and/or Spring, 1981-82.
Prerequisite: Permission of the instructor and advisor.

504. Design of Wood Structural Elements **(3)**
Lectures. A development of the principles involved in designing structural elements in wood and practice in their application. Fall or Spring.
Prerequisite: ERE 362.

State University of New York

State University's 64 geographically dispersed campuses bring educational opportunity within commuting distance of virtually all New York citizens and comprise the nation's largest, centrally managed system of public higher education.

When founded in 1948, the University consolidated 29 State-operated, but unaffiliated, institutions. In response to need, the University has grown to a point where its impact is felt educationally, culturally, and economically the length and breadth of the State.

More than 370,000 students are pursuing traditional study in classrooms or are working at home, at their own pace, through such innovative institutions as Empire State College, whose students follow individualized and often nontraditional paths to a degree. Of the total enrollment, more than 100,000 students are 24 years or older, reflecting State University's services to specific constituencies, such as refresher courses for the professional community, continuing educational opportunities for returning servicemen, and personal enrichment for the more mature persons.

State University's research contributions are helping to solve some of modern society's most urgent problems. It was a State University scientist who first warned the world of potentially harmful mercury deposits in canned fish, and another who made the connection between automobile and industrial smoke combining to cause

changes in weather patterns. Other University researchers continue important studies in such wide-ranging areas as immunology, marine biology, sickle-cell anemia, and organ transplantation.

More than 1,000 Public Service activities are currently being pursued on State University campuses. Examples of these efforts include: special training courses for local government personnel, State civil service personnel, and the unemployed; participation by campus personnel in joint community planning or project work, and campus-community arrangements for community use of campus facilities.

A distinguished faculty includes nationally and internationally recognized figures in all the major disciplines. Their efforts are recognized each year in the form of such prestigious awards as Fulbright-Hayes, Guggenheim and Danforth Fellowships.

The University offers a wide diversity of what are considered the more conventional career fields, such as engineering, medicine, literature, dairy farming, medical technology, accounting, social work, forestry, and automotive technology. Additionally, its responsiveness to progress in all areas of learning and to tomorrow's developing societal needs has resulted in concentrations which include pollution, urban studies, computer science, immunology, preservation of national resources, and microbiology.

SUNY programs for the educationally and economically disadvantaged have become models for delivering better learning opportunities to a once-forgotten segment of society. Educational Opportunity Centers offer high school equivalency and college preparatory courses to provide young people and adults with the opportunity to begin college or to learn marketable skills. In addition, campus based Educational Opportunity Programs provide counseling, developmental education and financial aid to disadvantaged students in traditional degree programs.

Overall, at its EOC's, two-year colleges, four-year campuses and university and medical centers, the University offers 3,600 academic programs. Degree opportunities range from two-year associate programs to doctoral studies offered at 12 senior campuses.

The 30 two-year community colleges operating under the program of State University play a unique role in the expansion of educational opportunity, by:

Providing local industry with trained technicians in a wide variety of occupational curricula;

Providing transfer options to students who wish to go on and earn advanced degrees, and;

Providing the community with yet another source for technical and professional upgrading as well as personal enrichment.

During its brief history, State University has graduated more than 705,000 alumni, the majority of whom are pursuing their careers in communities across the State.

State University is governed by a Board of Trustees, appointed by the Governor, which directly determines the policies to be followed by the 34 State-supported campuses. Community colleges have their own local boards of trustees whose relationship to the SUNY board is defined by law. The State contributes one-third to 40 percent of their operating cost and one-half of their capital costs.

The State University motto is: "To Learn—To Search—To Serve."

STATE UNIVERSITY OF NEW YORK

UNIVERSITY CENTERS

State University of New York at Albany
State University of New York at Binghamton
State University of New York at Buffalo
State University of New York at Stony Brook

COLLEGES OF ARTS AND SCIENCES

Empire State College
State University College at Brockport
State University College at Buffalo
State University College at Cortland
State University College at Fredonia
State University College at Geneseo
State University College at New Paltz
State University College at Old Westbury
State University College at Oneonta
State University College at Oswego
State University College at Plattsburgh
State University College at Potsdam
State University College at Purchase

COLLEGES AND CENTERS FOR THE HEALTH SCIENCES

Downstate Medical Center at Brooklyn
Upstate Medical Center at Syracuse
College of Optometry at New York City
Health Sciences Center at Buffalo University Center*
Health Sciences Center at Stony Brook University Center

AGRICULTURAL AND TECHNICAL COLLEGES

Agricultural and Technical College at Alfred
Agricultural and Technical College at Canton
Agricultural and Technical College at Cobleskill
Agricultural and Technical College at Delhi
Agricultural and Technical College at Farmingdale
Agricultural and Technical College at Morrisville

SPECIALIZED COLLEGES

College of Environmental Science and Forestry at Syracuse
Maritime College at Fort Schuyler
College of Technology at Utica/Rome
Fashion Institute of Technology at New York City***

STATUTORY COLLEGES**

College of Agriculture and Life Sciences at Cornell University
College of Ceramics at Alfred University
College of Human Ecology at Cornell University
School of Industrial and Labor Relations at Cornell University
College of Veterinary Medicine at Cornell University

COMMUNITY COLLEGES

(Locally-sponsored, two-year colleges under the program of State University)

Adirondack Community College at Glens Falls
Broome Community College at Binghamton
Cayuga County Community College at Auburn
Clinton Community College at Plattsburgh
Columbia-Greene Community College at Hudson
Community College of the Finger Lakes at Canandaigua
Corning Community College at Corning
Dutchess Community College at Poughkeepsie
Erie Community College at Williamsville, Buffalo and Orchard Park
Fashion Institute of Technology at New York City
Fulton-Montgomery Community College at Johnstown
Genesee Community College at Batavia
Herkimer County Community College at Herkimer
Hudson Valley Community College at Troy
Jamestown Community College at Jamestown
Jefferson Community College at Watertown
Mohawk Valley Community College at Utica
Monroe Community College at Rochester
Nassau Community College at Garden City
Niagara County Community College at Sanborn
North Country Community College at Saranac Lake
Onondaga Community College at Syracuse
Orange County Community College at Middletown
Rockland Community College at Suffern
Schenectady County Community College at Schenectady
Suffolk County Community College at Selden, Riverhead and Brentwood
Sullivan County Community College at Loch Sheldrake
Tompkins Cortland Community College at Dryden
Ulster County Community College at Stone Ridge
Westchester Community College at Valhalla

*The Health Sciences Centers at Buffalo and Stony Brook are operated under the administration of their respective University Centers.

**These operate as "contract colleges" on the campuses of independent universities.

***While authorized to offer such baccalaureate and master's degree programs as may be approved pursuant to the provisions of the Master Plan, in addition to the associate degree, the Fashion Institute of Technology is financed and administered in the manner provided for community colleges.

College of Environmental Science and Forestry

COLLEGE ADMINISTRATION

President	EDWARD E. PALMER
Assistant to the President	JENIFER BREYER
Assistant to the President for Community Relations	ROLLA W. COCHRAN
Vice President for Program Affairs	DONALD F. BEHREND
Assistant Vice President for Research Programs	JAMES W. GEIS
Assistant Vice President for Academic Programs	ROBERT H. FREY
Coordinator of Sponsored Programs	J. DONALD MABIE
Director of Admissions	ROBERT L. FRIEDMAN
Director, Institute of Environmental Program Affairs (IEPA)	JAMES W. GEIS
Coordinator of Demonstration and Information, IEPA	ROLLA W. COCHRAN
Vice President for Student Affairs	HARRISON H. PAYNE
Director of Financial Aids	JOHN E. VIEW
Registrar	ROBERT S. NORTH
Adjunct Foreign Student Counselor	VIRGINIA T. TORELLI
Vice President for Administration and Services	DAVID G. ANDERSON
Assistant to the Vice President	JUDITH A. LaMANNA
Director of Business and Fiscal Affairs	HARRY J. CORR
Librarian	DONALD F. WEBSTER
Director of Educational Communications	BERNARD T. HOLTMAN
Director of Computer Services	CHARLES N. LEE
Director of Personnel and Affirmative Action	JOHN S. FORSTER
Director of Physical Plant	BRUCE E. REICHEL
Director of Campus Safety and Security	BRIAN M. SPEER
Associate for Institutional Research	RHONDDA K. CASSETTA
Director of Analytical and Technical Services	JOHN A. MEYER
Director of Administrative Data Processing	SHEILA M. CROWLEY
Adjunct Foreign Visitor Counselor	VIRGINIA T. TORELLI
College Forest Property Manager	RICHARD A. SCHWAB
Dean, School of Biology, Chemistry and Ecology	STUART W. TANENBAUM
Dean, School of Continuing Education	JOHN M. YAVORSKY
Dean, School of Environmental and Resource Engineering	WILLIAM P. TULLY
Dean, School of Forestry	JOHN V. BERGLUND
Dean, School of Landscape Architecture	ROBERT G. REIMANN
Director, School of Forest Technology	JAMES E. COUFAL
Director, Graduate Program in Environmental Science	ROBERT D. HENNIGAN
Acting Director, Adirondack Ecological Center	WILLIAM F. PORTER
Director, Empire State Paper Research Institute	BENGT LEOPOLD
Acting Director, Polymer Research Institute	KENNETH J. SMITH
Director, Ultrastructure Studies Center	WILFRED A. CÔTÉ, JR.
Director, Tropical Timber Information Center	ROBERT W. MEYER
Director, Cellulose Research Institute	TORE E. TIMELL
Project Leader, U.S. Forest Service Cooperative Research Unit	ROWAN A. ROWNTREE
Director, Renewable Materials Institute	WILFRED A. CÔTÉ, JR.

COLLEGE FACULTY AND PROFESSIONAL STAFF

This listing represents an official record of the State University of New York College of Environmental Science and Forestry faculty and professional staff for 1981. It is designed for use in 1981-82.

The date in parentheses after each name denotes the first year of service, two or more dates, the term of service.

LAWRENCE P. ABRAHAMSON (1977), *Senior Research Associate*, School of Forestry and Department of Environmental and Forest Biology; B.S., Michigan Technical University, 1964; M.S., University of Wisconsin, 1967; Ph.D., 1969

JUDD H. ALEXANDER (1979), *Adjunct Professor*, Graduate Program in Environmental Science; B.A., Carleton College, 1949; P.M.D., Harvard Business School, 1967

MAURICE M. ALEXANDER (1949), *Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; *Director*, Roosevelt Wildlife Forest Experiment Station; B.S., New York State College of Forestry, 1940; M.S., University of Connecticut, 1942; Ph.D., State University of New York College of Forestry, 1950

DOUGLAS C. ALLEN (1968), *Professor*, Department of Environmental and Forest Biology; B.S., University of Maine, 1962; M.S., 1965; Ph.D., University of Michigan, 1968

IRA H. AMES (1972), *Adjunct Associate Professor*, Department of Environmental and Forest Biology; B.A., Brooklyn College, 1959; M.S., New York University, 1962; Ph.D., 1966

DAVID G. ANDERSON (1959), *Vice President for Administration and Services; Professor;* A.A.S., State University of New York College of Forestry (Ranger School), 1950; B.S., State University of New York College of Forestry, 1953; M.S., University of Utah, 1958; M.P.A., Syracuse University, 1977

ROBERT E. ANTHONY (1953), *Technical Specialist*, Department of Environmental and Forest Biology; A.A.S., State University of New York Agricultural and Technical College at Morrisville, 1952

ROBERT W. ARSENEAU (1972), *Programmer/Analyst*, Administrative Data Processing; A.A.S., Mohawk Valley Community College, 1967; B.S., Syracuse University, 1978

CAROLINE D. BAILEY (1978), *Technical Assistant*, School of Landscape Architecture

JAMES P. BAMBACHT (1967), *Associate Professor*, Department of Paper Science and Engineering; A.B., Kalamazoo College, 1954; M.S., The Institute of Paper Chemistry, 1956; Ph.D., State University of New York College of Environmental Science and Forestry, 1973

C. ELLISON BECK (1970), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services

JOANN D. BECK (1979), *Visiting Assistant Professor*, School of Landscape Architecture; B.A., Lake Forest College, 1968; M.L.A., SUNY College of Environmental Science and Forestry, 1980

DONALD F. BEHREND (1960-67) (1968), *Vice President for Program Affairs*, Office of Program Affairs; *Professor*, Department of Environmental and Forest Biology; B.S., University of Connecticut, 1958; M.S., 1960; Ph.D., State University of New York College of Forestry, 1966

JOHN D. BENNETT (1960), *Associate Professor*, School of Forestry; Graduate Program in Environmental Science; B.A., Ohio Wesleyan University, 1954; Ph.D., Syracuse University, 1968; *Chancellor's Award for Excellence in Teaching* (1973)

JOHN V. BERGLUND (1965), *Dean and Professor*, School of Forestry; B.S., Pennsylvania State University, 1962; M.S., 1964; Ph.D., State University of New York College of Forestry, 1968

WILLIAM H. BETTINGER (1972), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services; A.A.S., Rochester Institute of Technology, 1955

DONALD H. BICKELHAUPT (1969), *Research Assistant*, School of Forestry; B.S., State University of New York College of Forestry, 1969; M.S., State University of New York College of Environmental Science and Forestry, 1980

PETER E. BLACK (1965), *Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., University of Michigan, 1956; M.F., 1958; Ph.D., Colorado State University, 1961; *Executive Chairman of the Faculty* (1974-76) (1976-78)

GARY BLISS (1972), *Technical Assistant*, Department of Environmental and Forest Biology; State University of New York College of Environmental Science and Forestry (Ranger School), 1972

WILLIAM R. BORGSTEDE (1971), *Technical Assistant*, Department of Environmental and Forest Biology; A.A.S., Miner Institute, 1966; A.A.S., State University of New York College at Delhi, 1970; B.S., State University of New York College of Environmental Science and Forestry, 1975, M.S.; Syracuse University, 1978

JENIFER BREYER (1979), *Assistant to the President*; B.A., University of Northern Iowa, 1964; M.A., Indiana University, 1970

JEROME BREZNER (1961), *Professor*, Department of Environmental and Forest Biology; A.B., University of Rochester, 1952; A.M., University of Missouri, 1956; Ph.D., 1959

KENNETH W. BRITT (1971), *Senior Research Associate*; Department of Paper Science and Engineering; B.Chem., Cornell University, 1929

ROBERT H. BROCK, JR. (1967), *Chairman and Professor*, Department of Forest Engineering; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1958; M.S., 1959; Ph.D., Cornell University, 1971

RANIER H. BROCKE (1969), *Senior Research Associate*, Adirondack Ecological Center; B.S., Michigan State University, 1955; M.S., 1957; Ph.D., 1970

DAVID F. BRODOWSKI (1977), *Technical Assistant*, Department of Environmental and Forest Biology; B.S., Cornell University, 1975

ALTON F. BROWN (1963), *Technical Specialist*, Empire State Paper Research Institute

THOMAS E. BROWN (1977), *Adjunct Assistant Professor*, Department of Environmental and Forest Biology; B.S., Niagara University, 1957; M.S., State University of New York College of Environmental Science and Forestry, 1968

ROBERT J. BURGESS (1981), *Chairman* and *Professor*, Department of Environmental and Forest Biology; B.S., University of Wisconsin (Milwaukee), 1957; M.S., University of Wisconsin (Madison), 1959; Ph.D., 1961

KENNETH F. BURNS (1970), *Technical Assistant*, School of Forestry; A.A.S., Paul Smith's College, 1969

HARRY W. BURRY (1962), *Extension Specialist*, School of Forestry; *Associate Professor*; B.S., State University of New York College of Forestry, 1941; M.F., 1964

ISRAEL CABASSO (1981), *Professor*, Department of Chemistry; Associate Director, Polymer Research Institute; B.S., Hebrew University, 1966; M.S., 1968; Ph.D. Weizmann Institute of Science, 1973

PAUL M. CALUWE (1969), *Associate Professor*, Department of Chemistry; *Associate Member*, Polymer Research Institute; Ph.D., University of Leuven, 1967

WILBUR H. CAMPBELL (1975), *Associate Professor*, Department of Chemistry; A.A., Santa Ana College, 1965; B.A., Pomona College, 1967; Ph.D., University of Wisconsin, 1972

HUGH O. CANHAM (1966), *Associate Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1960; M.S., 1962; Ph.D., 1971

DIANNE M. CAPRITTA (1967), *Associate Librarian*, F. Franklin Moon Library; B.S., University of Illinois, 1965; M.S.L.S., Syracuse University, 1967

RHONDDA K. CASSETTA (1967), *Associate for Institutional Research*, Office of the Vice President for Administration and Services; A.B., Elmira College, 1933

COSTAS A. CASSIOS (1978), *Adjunct Professor*, Landscape Architecture; B.S., University of Thessaloniki, 1965; M.S., Graduate Industrial School, 1969; M.S., University of Wisconsin, 1972; Ph.D., 1976

JOHN D. CASTELLO (1978), *Assistant Professor*, Department of Environmental and Forest Biology; B.A., Montclair State College, 1973; M.S., Washington State University, 1975; Ph.D., University of Wisconsin, 1978

ROBERT E. CHAMBERS (1967), *Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., Pennsylvania State University, 1954; M.S., 1956; Ph.D., Ohio State University, 1972

NEILS B. CHRISTIANSEN (1960), *Senior Research Associate*; School of Forestry; B.S., University of Idaho, 1957; M.S., State University of New York College of Forestry, 1959; Ph.D., 1966

ROLLA W. COCHRAN (1964), *Assistant to the President for Community Relations*; Office of the President; *Associate Professor*; Coordinator of Demonstration and Information, Institute of Environmental Affairs; Associate Professor, Graduate Program in Environmental Science; B.A., Denison University, 1949; M.S., Ohio State University, 1951

ETHEL M. COMP (1978), *Personnel Associate*, Office of the Vice President for Administration and Services

HARRY J. CORR (1967), *Director of Business and Fiscal Affairs*, Office of the Vice President for Administration and Services; B.S. Siena College, 1957

WILFRED A. COTE, JR. (1950), *Professor*, Department of Wood Products Engineering; Director, Renewable Materials Institute and N.C. Brown Center for Ultrastructure Studies; B.S., University of Maine, 1949; M.F., Duke University, 1950; Ph.D., State University of New York College of Forestry, 1958

JAMES E. COUFAL (1965), *Director and Professor*, School of Forest Technology; State University of New York College of Forestry (Ranger School), 1957; B.S., State University of New York College of Forestry, 1960; M.S., 1962; Ed.S., State University of New York at Albany, 1976

PHILLIP J. CRAUL (1968), *Professor and Curriculum Director*, School of Forestry; B.S.F., Pennsylvania State University, 1954; M.S., 1960; Ph.D., 1964

JAMES O. CREVELLING (1970), *Forest Property Manager*, Wanakena and Cranberry Campuses; A.A.S., Paul Smith's College, 1965; B.S., University of Massachusetts, 1967

CLAY M. CROSBY (1964), *Research Assistant*, Empire State Paper Research Institute; B.S., State University of New York College of Forestry, 1964; M.S., 1970

SHEILA M. CROWLEY (1977), *Director, Administrative Data Processing*, Office of the Vice President for Administration and Services; A.B., Albertus Magnus College, 1967; M.S., Syracuse University, 1979

JUSTIN CULKOWSKI (1978), *Director of Alumni Affairs*, B.S., State University of New York College of Environmental Science and Forestry, 1973

TIBERIUS CUNIA (1968), *Professor*, School of Forestry; Graduate Program in Environmental Science; Forest Engineer, Ecole Nat. des Eaux et Forets, 1951; M.S., McGill University, 1957

GEORGE W. CURRY (1966), *Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.A., Michigan State University, 1962; B.S., 1965; M.L.A., University of Illinois, 1969

MIROSLAW M. CZAPOWSKYJ (1979), *Adjunct Professor*, School of Forestry; Diplomforstwirt, Ludwig-Maximiliams University, 1949; M.S., University of Maine, 1958; Ph.D., Rutgers University, 1962

BENJAMIN V. DALL (1975), *Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., Yale University, 1955; M.F., 1956; J.D., University of Virginia, 1959; Ph.D., Pennsylvania State University, 1972

ROBERT W. DAVIDSON (1957), *Professor*, Department of Wood Products Engineering; *Director*, Tropical Timber Information Center; B.S., Montana State University, 1948; M.S., State University of New York College of Forestry, 1956; Ph.D., 1960

ARNOLD C. DAY (1947), *Technical Specialist*, N.C. Brown Center for Ultrastructure Studies

LOUIS D. DE GENNARO (1980), *Adjunct Professor*, Department of Environmental and Forest Biology; B.S., Fordham University, 1948; M.S., Boston College, 1950

SALVACION DE LA PAZ (1973), *Associate Librarian*, F. Franklin Moon Library; B.S.L.S., University of the Philippines, 1956; M.S.L.S., Simmons College, 1962

ELLEN M. DELLMORE (1980), *Technical Assistant*, Wanakena Campus; A.A.S., State University of New York College of Environmental Science and Forestry, 1977; A.A.S., Community College of the Air Force, 1979

CARLTON W. DENCE (1951), *Professor*, Empire State Paper Research Institute; Graduate Program in Environmental Science; *Professor*, B.S., Syracuse University, 1947; M.S., State University of New York College of Forestry, 1949; Ph.D., 1959

CARL H. DE ZEEUW (1946), *Professor*, Department of Wood Products Engineering; A.B., Michigan State College, 1934; B.S., 1937; M.S., State University of New York College of Forestry, 1939; Ph.D., 1949

ARTHUR G. DILLON (1976), *Technical Specialist*, Department of Paper Science and Engineering; B.S., State University of New York College of Environmental Science and Forestry, 1974

DANIEL L. DINDAL (1966), *Professor*, Department of Environmental and Forest Biology; B.S., Ohio State University, 1958; M.A., 1961; Ph.D., 1967; *Chancellor's Award for Excellence in Teaching* (1974)

JULIA O. DOMINGUE (1980), *Technical Specialist*, Department of Forest Engineering; B.A., University of Illinois, 1975; M.S., 1979

ALLAN P. DREW (1980), *Assistant Professor*, School of Forestry; B.S., University of Illinois, 1965; M.S., University of Arizona, 1967; Ph.D., Oregon State University, 1974

MICHAEL J. DUGGIN (1979), *Associate Professor*, Department of Forest Engineering; Graduate Program in Environmental Science; B.Sc., Melbourne University, 1959; Ph.D., Monash University, 1965

PATRICK R. DURKIN (1980), *Adjunct Assistant Professor*, Graduate Program in Environmental Science; B.A., State University of New York College of Fredonia, 1968; M.S., Fordham University, 1972; Ph.D., State University of New York College of Environmental Science and Forestry, 1979

GEORGE F. EARLE (1952), *Professor*, School of Landscape Architecture; B.F.A., Syracuse University, 1937; M.F.A., Yale University, 1946

RONALD EBY (1968), *Research Associate*; Chemistry Department; B.S., State University of New York College of Environmental Science and Forestry, 1969; M.S., 1972; Ph.D., 1974

ANDREW L. EGGERS (1967), *Technical Specialist*, Educational Communications Section, Office of the Vice President for Administration and Services

ELIZABETH A. ELKINS (1973), *Associate Librarian*, F. Franklin Moon Library; B.A., Hartwick College, 1968; M.L.S., State University of New York at Geneseo, 1970

DONALD P. ELY (1980), *Adjunct Professor*, Graduate Program in Environmental Science; B.A., State University College for Teachers, Albany, 1951; M.A., Syracuse University, 1953; Ph.D., 1961

JOHN H. ENGELKEN (1952), *Assistant Professor; Forest Property Manager*, Tully Campus; B.S.F., Utah State University, 1950

GAIL ERWIN (1979), *Adjunct Member*, Employee Performance Evaluation Program Appeals Board; B.A., William Smith College, 1971; M.S., State University of New York at Oswego, 1974; J.D., Western New England College School of Law, 1978

ARTHUR R. ESCHNER (1961), *Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1950; M.S., Iowa State College, 1952; Ph.D., State University of New York College of Forestry, 1965

AMINUR EUSUFZAI (1977), *Technical Assistant*, Empire State Paper Research Institute; B.Sc. (Hons.), Dacca University, 1957; M.Sc., 1960; B.Sc. (Hons.), Forestry, Peshawar University, 1962, M.S., West Virginia University, 1969

MILDRED FAUST (1976), *Adjunct Professor*, School of Biology, Chemistry and Ecology; A.B., Penn College, 1921; M.S., University of Chicago, 1923; Ph.D., 1933

JOHN P. FELLEMAN (1973), *Associate Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.C.E., Cornell University, 1966; M.E.C., 1966; D.P.A., New York University, 1975

JOHN S. FISHLOCK (1965), *Technical Assistant*, Department of Environmental and Forest Biology; A.A.S., State University of New York College of Forestry, 1975

MICHAEL FLASHNER (1973), *Associate Professor*, Department of Chemistry; B.S., Brooklyn College, 1965; A.M., University of Michigan, 1970; Ph.D., 1971

JOHN S. FORSTER (1979), *Director of Personnel and Affirmative Action*, Office of the Vice President for Administration and Services; B.S., State University of New York at Buffalo, 1974; M.B.A., 1976

LEROY C. FORTMANN (1980), *Technical Specialist*, Department of Chemistry; B.S., University of Iowa, 1976; M.S., University of Nevada, 1978

CLAUDE C. FREEMAN (1959), *Associate Professor*, School of Landscape Architecture; B.S., State University of New York College of Forestry, 1959

ROBERT H. FREY (1977), *Assistant Vice President for Academic Programs, Associate Professor*, Graduate Program in Environmental Science; B.A., Valparaiso University, 1965; M.Ed., Springfield College, 1966; Ed.D., Indiana University, 1973

ROBERT L. FRIEDMAN (1967), *Director of Admissions*, Office of the Vice President for Program Affairs; A.B., Syracuse University, 1952; M.A., 1954

HARRY L. FRISHCH (1980), *Adjunct Distinguished Professor*, Department of Chemistry; Associate Member, Polymer Research Institute; A.B., Williams College, 1947; Ph.D., Polytechnic Institute of Brooklyn, 1952

ELLEN M. GALLAGHER (1980), *Technical Assistant*, Department of Environmental and Forest Biology; A.S., Westchester Community College, 1972; B.S., State University of New York at Cortland, 1974; M.S., State University of New York College of Environmental Science and Forestry, 1979

JOHN E. GANNON (1980), *Adjunct Associate Professor*, Department of Environmental Science and Forestry; B.S., Wayne State University, 1965; M.S., University of Michigan, 1967; Ph.D., University of Wisconsin, 1972

JAMES W. GEIS (1968), *Assistant Vice President for Research Programs, Executive Director of the Institute of Environmental Program Affairs, Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science, B.S.F., University of Illinois, 1965; M.S., 1967; Ph.D. State University of New York College of Environmental Science and Forestry, 1972

RONALD J. GIEGERICH (1977), *Technical Assistant*, Department of Environmental and Forest Biology; A.A.S., State University of New York Agricultural and Technical College at Cobleskill, 1976; B.S., State University of New York College of Environmental Science and Forestry, 1978

SERGE N. GORBATSEVICH (1956), *Associate Professor*, Department of Paper Science and Engineering; B.S., State University of New York College of Forestry, 1954; M.S., 1955

MORT GRANT (1976), *Adjunct Professor*, Institute of Environmental Program Affairs; B.A., Whitman College, 1945; M.B.A., University of Chicago, 1949; M.P.A., Harvard University, 1959

STEPHEN GRANZOW (1969), *Technical Specialist*, Empire State Paper Research Institute

MIKLOS A. J. GRATZER (1973), *Professor*, School of Forestry; Graduate Program in Environmental Science; B.Sc., University of British Columbia, 1959; M.S.R.C., University of Montana, 1965; Ph.D., 1971

PAUL F. GRAVES (1947), *Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1939; M.F., 1941; Ph.D., Syracuse University, 1949

CHARLES GREEN, JR. (1979), *Adjunct Professor*, Department of Paper Science and Engineering; B.S., University of Iowa, 1956

DAVID H. GRIFFIN (1968), *Professor*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1959; M.A., University of California, 1960; Ph.D., 1963

MICHAEL H. GRIGGS (1980), *Technical Assistant*, Environmental and Forest Biology

JAMES P. HALLIGAN (1979), *Technical Assistant*, School of Forestry; B.S., State University of New York College of Environmental Science and Forestry, 1974

JUDITH C. HAMILTON (1979), *Financial Aids Advisor*, Financial Aids Office; B.S., State University College at Brockport, 1967; M.S., State University of New York at Albany, 1968

ALAN LEE HANKIN (1978), *Associate for Continuing Education*, School of Continuing Education; B.A., Boston University, 1971; Teaching Certificate, University of New Hampshire, 1974; Ph.D., State University of New York College of Environmental Science and Forestry, 1981

ROBERT B. HANNA (1977), *Assistant Director*, N.C. Brown Center for Ultrastructure Studies; *Associate Professor*, Department of Wood Products Engineering and Graduate Program in Environmental Science; B.S., University of Michigan, 1967; M.S. State University of New York College of Environmental Science and Forestry, 1971; Ph.D., 1973

DAVID L. HANSELMAN (1963), *Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.S., Cornell University, 1957; M.S., 1958; Ph.D., Ohio State University, 1963

DAVID B. HARPER (1972), *Senior Research Associate*, School of Landscape Architecture; B.S., Bates College, 1959; M.R.P., University of Pennsylvania, 1969

ROY C. HARTENSTEIN (1959-65) (1967), *Professor*, Department of Environmental and Forest Biology; B.S., State Teachers College at Buffalo, 1953; M.S., Syracuse University, 1957; Ph.D., State University of New York College of Forestry, 1959

ALAN R. HARVEY (1977), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administrative Services

JOHN P. HASSETT (1980), *Research Associate*, School of Biology, Chemistry and Ecology; B.S., University of Maryland, 1971; M.S., University of Wisconsin, 1973; Ph.D., 1979

RICHARD S. HAWKS (1979), *Assistant Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.L.A., State University of New York College of Environmental Science and Forestry, 1972; M.L.A., Harvard University, 1978

GORDON M. HEISLER (1973), *Adjunct Associate Professor*, School of Forestry; B.S., Pennsylvania State University, 1961; M.F., Yale University, 1962; Ph.D., State University of New York College of Forestry, 1970

ROBERT D. HENNIGAN (1967), *Director*, Graduate Program in Environmental Science; B.C.E., Manhattan College, 1949; M.A., Syracuse University, 1964

LEE P. HERRINGTON (1965), *Professor and Research Coordinator*, School of Forestry; B.S., University of Maine, 1959; M.F., Yale School of Forestry, 1960; Ph.D., Yale University, 1964

BERNARD T. HOLTMAN (1968), *TV/Motion Picture Producer-Director, Director*, Educational Communications Section, Office of the Vice President for Administration and Services; Graduate Program in Environmental Science; B.A., Siena College, 1950; M.S., Syracuse University, 1972

MARY O'BRIEN HOOVEN (1980), *Food Service Supervisor*, Wanakena and Cranberry Lake Campuses, B.A., State University of New York at Buffalo, 1972

PAUL F. HOPKINS (1979), *Assistant Professor*, Forest Engineering; B.S., University of Maine, 1977; M.S., State University of New York College of Environmental Science and Forestry, 1979

ALLEN F. HORN, JR. (1957), *Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., Michigan State University, 1950; M.S., 1951; Ph.D., State University of New York College of Forestry, 1957; L.L.B., Syracuse University, 1967

STEPHEN B. HORSLEY (1979), *Adjunct Associate Professor*, School of Forestry, B.S., Pennsylvania State University, 1965; M.A., University of Massachusetts, 1968; Ph.D., 1970

JOEL R. HOWARD (1977), *Coordinator*, Summer Sessions in Field Forestry; *Instructor*, School of Forestry; State University of New York College of Forestry (Ranger School), 1966; Forest Property Manager, Warrensburg, 1979; B.S., State University of New York College of Environmental Science and Forestry, 1973; M.S., 1977

JOHN J. HOWARD (1978), *Adjunct Associate Professor*, Department of Environmental and Forest Biology; B.A., University of New Hampshire, 1966; M.P.H., Yale University, 1970, Dr. P.H., 1973

HUGO A. JAMNBACK (1973), *Adjunct Senior Research Associate*, Department of Environmental and Forest Biology; B.A., Boston University, 1949; M.A., University of Massachusetts, 1951; Ph.D., 1953

WILLIAM E. JARVIS (1981), *Assistant Librarian*, F. Franklin Moon Library; B.A., Ohio University, 1967; M.A., Syracuse University, 1971; M.L.S., 1979

ROBERT V. JELINEK (1972), *Professor*, Department of Paper Science and Engineering; Graduate Program in Environmental Science; B.S., Columbia University, 1945; M.S., 1947; Ph.D., 1953

HAZEL S. JENNISON (1965), *Research Assistant*, Analytical and Technical Services, Office of the Vice President for Administration and Services; B.S., Western Kentucky State University, 1941; M.S., Syracuse University, 1966

DAVID L. JOHNSON (1975), *Assistant Professor*, Department of Chemistry; Graduate Program in Environmental Science; B.S., Antioch College, 1965; Ph.D., University of Rhode Island, 1973

ROBERTA S. JONES (1979), *Assistant Registrar*, Office of the Vice President for Student Affairs; A.B., Colgate University, 1978

DAVID F. KARNOSKY (1977), *Adjunct Associate Professor*, Department of Environmental and Forest Biology; B.S., University of Wisconsin, 1971; M.S., 1972; Ph.D., 1975

RONALD R. KARNS (1965), *Editorial Associate*, Office of Publications; B.S., Ohio State University, 1954

ROWENA V. KATHER (1974), *Assistant to the Director*, Analytical and Technical Services, Office of the Vice President for Administration and Services; B.A., Syracuse University, 1979

EDWIN H. KETCHLEDGE (1955), *Distinguished Teaching Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1949; M.S., 1950; Ph.D., Stanford University, 1957

JUDITH J. KIMBERLIN (1981), *Personnel Associate* for Compliance and Development, Office of the Vice President for Administration and Services; A.A.S., Pennsylvania State University, 1964; B.A., State University of New York College at Cortland, 1975

THOMAS W. KOPP (1980), *Research Associate*, Office of Program Affairs; B.A., State University of New York at Oswego, 1969; M.S., Syracuse University, 1980

LEE E. KOPPELMAN (1975), *Adjunct Professor*, Institute of Environmental Program Affairs; B.E., City College of New York, 1950; M.S., Pratt Institute Graduate School of Architecture, 1962; D.P.A., New York University, 1970

DONALD E. KOTEN (1961), *Associate Professor*, School of Forestry; B.A., North Central College, 1951; B.S., Oregon State College, 1957; Ph.D., State University of New York College of Forestry, 1966

STELLA D. KROFT (1973), *Technical Assistant*, F. Franklin Moon Library

VIRENDRA KUMAR (1979), *Research Associate*, Department of Chemistry; B.S. (Hons.), Banaras Hindu University, 1966; M.S., 1968; Ph.D., State University of New York at Buffalo, 1975

FRANK E. KURCZEWSKI (1966), *Professor*, Department of Environmental and Forest Biology; B.S., Allegheny College, 1958; M.S., Cornell University, 1962; Ph.D., 1964

GEORGE H. KYANKA (1967), *Chairman and Professor*, Department of Wood Products Engineering; B.S., Syracuse University, 1962; M.S., 1966; *Chancellor's Award for Excellence in Teaching* (1973); Ph.D., 1976

YUAN-ZONG LAI (1981), *Senior Research Associate*, Empire State Paper Research Institute; B.S., National Taiwan University, 1963; M.S., University of Washington, 1966; M.S., 1967; Ph.D., 1968

ROBERT T. LALONDE (1959), *Professor*, Department of Chemistry; B.A., St. John's University, 1953; Ph.D., University of Colorado, 1957

JUDITH A. LAMANNA (1973), *Assistant to the Vice President*; Office of the Vice President for Administration and Services; A.A.S., Onondaga Community College, 1969; B.A., LeMoyne College, 1971; M.P.A., Syracuse University, 1976

GERALD N. LANIER (1970), *Professor*, Department of Environmental and Forest Biology; B.S., University of California, 1960; M.S., 1965; Ph.D., 1967

RONALD F. LAPLAINE (1948), *Technical Specialist*, Department of Paper Science and Engineering

CHARLES C. LARSON (1950), *Professor*, School of Forestry; A.S., North Dakota State School of Forestry, 1938; B.S., University of Minnesota, 1940; M.S., University of Vermont, 1943; Ph.D., State University of New York College of Forestry, 1952

RICHARD V. LEA (1946-56) (1967), *Associate Professor*, School of Forestry; B.S., State University of New York College of Forestry, 1946; M.S., 1948; Ph.D., 1953

CHARLES N. LEE (1959), *Director*, Computer Services; *Professor*, Department of Forest Engineering; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1949; B.C.E., Syracuse University, 1957; M.C.E., 1959

XIN-FU LENG (1980), *Research Assistant*, Department of Environmental and Forest Biology; B.S., Peking Agricultural University, 1953

RAYMOND E. LEONARD (1964), *Adjunct Professor*, Institute of Environmental Program Affairs; B.S., University of Vermont, 1955; M.M.M., University of Helsinki, 1957; M.F., Yale University, 1964; Ph.D., State University of New York College of Forestry, 1967

BENGT LEOPOLD (1961), *Professor and Chairman*, Department of Paper Science and Engineering; *Director*, Empire State Paper Research Institute; B.Sc., Royal Institute of Technology, Stockholm, 1947; Licentiat, 1949; Ph.D., 1952

GIDEON LEVIN (1972), *Associate Professor*, Polymer Research Institute; B.S., Technion, Israel Institute of Technology, 1960; M.S., Purdue University, 1965; Ph.D., State University of New York College of Forestry, 1971

ALLEN R. LEWIS (1970), *Associate Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.A., University of Oklahoma, 1959; M.C.P., University of California (Berkeley), 1961; *Executive Chairman of the Faculty* (1978)

JEANNE E. LISI (1980), *Technical Assistant*, Administrative Data Processing; A.A.S., Herkimer County Community College, 1979

PHILIP LUNER (1957), *Senior Research Associate*, Empire State Paper Research Institute; Professor, Graduate Program in Environmental Science; *Associate Member*, Polymer Research Institute; B.Sc., University of Montreal (Loyola College), 1947; Ph.D., McGill University, 1951

EDWARD M. LUNK (1978), *Instructor*, School of Forest Technology, B.S., University of Michigan, 1971; B.S.F., 1976; M.S. 1975

J. DONALD MABIE (1967), *Coordinator for Sponsored Programs*, Office of the Vice President for Program Affairs; B.S., State University of New York at Albany, 1961

WALTER A. MAIER (1960), *Technical Specialist*, Department of Wood Products Engineering; B.S., State University of New York College of Forestry, 1960

SIDNEY L. MANES (1980), *Adjunct Associate Professor*, School of Continuing Education; A.B., Pennsylvania State University, 1950; J.D., Syracuse University College of Law, 1952

PAUL D. MANION (1967), *Professor*, Department of Environmental and Forest Biology; B.S., University of Minnesota, 1962; M.S., 1965; Ph.D., 1967

SETH MANTE (1981), *Research Associate*, Tissue Culture Laboratory; B.S., (Hons.), University of Ghana, 1968; M.S., 1969; Ph.D., McGill University, 1974

MARY ANNE T. MARANO (1972), *Bursar*, Office of the Vice President for Administration and Services; A.A., Onondaga Community College, 1967

FRANK L. MARAVIGLIA (1964), *Associate Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; B.S., State University of New York College at Oswego, 1958; M.S., Hofstra University, 1963

RICHARD E. MARK (1970), *Senior Research Associate*, Empire State Paper Research Institute; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1950; Master of Forestry, Yale University, 1960; Doctor of Forestry, 1965

RAYMOND L. MARLER (1970), *Senior Research Associate*, School of Forestry; B.S., University of Michigan, 1948; M.F., 1948

DAVID A. MARQUIS (1979), *Adjunct Professor*, School of Forestry; B.S., Pennsylvania State University, 1955; M.S., Yale University, 1963; Ph.D., 1973

CHARLES E. MARTIN II (1962), *Professor*, School of Forest Technology; B.S., Duke University, 1953; M.F., 1954

GEORGE C. MARTIN (1979), *Adjunct Assistant Professor*, Department of Chemistry; *Associate Member*, Polymer Research Institute; B.S., Purdue University, 1970; Ph.D., University of Minnesota, 1976

RENATA MARTON (1957), *Senior Research Associate*, Empire State Paper Research Institute; M.S., Jagiello University, 1934; Ph.D., 1936

GEORGE F. MATTFELD (1965) (1978), *Adjunct Associate Professor*, Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1962; M.S., University of Michigan, 1964; Ph.D., State University of New York College of Environmental Science and Forestry, 1974

GWYNNE L. MAY (1973), *Technical Assistant*, Computer Center

CHARLES A. MAYNARD (1980), *Research Associate*, School of Forestry; B.S., Iowa State University, 1974; M.S., 1977; Ph.D., Iowa State University, 1980

RICHARD MCCLIMANS (1977), *Senior Research Associate*, Department of Forest Engineering; Graduate Program in Environmental Science; B.S., Merrimack College, 1961

BRIAN MCINTYRE (1980), *Technical Specialist*, Department of Chemistry, B.S., New York State College of Environmental Science and Forestry, 1979

JOHN J. MCKEON (1969), *Technical Specialist*, N.C. Brown Center for Ultrastructure Studies

DONALD G. MCLEAN (1968), *Programmer Analyst*, Computer Center; B.A., Syracuse University, 1975

VINEETA MEHRA (1979), *Visiting Assistant Professor*, School of Landscape Architecture; B.S., Chandigach, India, College of Architecture, 1975; M.L.A. No. Delhi, India, School of Planning and Architecture, 1977

JOHN A. MEYER (1958), *Director*, Analytical and Technical Services, Office of the Vice President for Administration and Services; *Senior Research Associate and Professor*, Department of Chemistry; Graduate Program in Environmental Science; *Associate Member*, Polymer Research Institute; B.S., Pennsylvania State College, 1949; M.S., 1950; Ph.D., State University of New York College of Forestry, 1958; *Chancellor's Award for Excellence in Professional Service* (1977)

ROBERT W. MEYER (1979), *Associate Professor*, Department of Wood Products Engineering; Graduate Program in Environmental Science; *Director*, Tropical Timber Information Center; B.S.F., University of Washington, 1962; M.F., 1964; Ph.D., State University of New York College of Forestry, 1967

HOWARD C. MILLER (1950), *Extension Specialist and Professor*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1941; Ph.D., Cornell University, 1951

RICHARD W. MILLER (1966), *Assistant Professor*, School of Forest Technology; State University of New York College of Forestry (Ranger School), 1953; B.S., State University of New York College of Forestry, 1956

MYRON J. MITCHELL (1975), *Associate Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.A., Lake Forest College, 1969; Ph.D., University of Calgary, 1974

DOUGLAS B. MONTEITH (1977), *Senior Research Associate*, School of Forestry; B.S., University of Maine, 1965; M.S., 1967

RAYMOND A. MOORE (1954), *Associate Professor*, Department of Wood Products Engineering; B.S.F., West Virginia University, 1951; M.S., North Carolina State College, 1952

CHARLIE D. MORRIS (1972), *Adjunct Associate Professor*, Department of Environmental and Forest Biology; B..S., Ohio University, 1963; M.S., University of Wisconsin, 1967; Ph.D., 1969

DOUGLAS A. MORRISON (1969), *Research Associate*, School of Forestry; Graduate Program in Environmental Science; B.A., University of Western Ontario, 1966; M.S., University of Oregon, 1967; Ph.D., 1969

DIETLAND MULLER-SCHWARZE (1973), *Professor*, Department of Environmental and Forest Biology; Doctorate, Max Planck Institute, 1958-1960; Ph.D., University of Freiburg, 1963

EDWARD J. MULLIGAN (1967), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services; Certified graduate, Morrisville Agricultural and Technical College, 1942

RICHARD T. MURPHY (1980), *Assistant Professor*, School of Landscape Architecture; B.L.A., Institute of Technology, University of Minnesota, 1975; B.E.D., 1975; M.L.A., Harvard Graduate School of Design, 1980

JAMES P. NAKAS (1979), *Assistant Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., LeMoyne College, 1968; M.S., Seton Hall University, 1970; Ph.D., Rutgers University, 1976

TSUTOMU NAKATSUGAWA (1968), *Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B. Agric., Tokyo University, 1957; M.S., Iowa State University, 1961; Ph.D., 1964

ANTHONY J. NAPPI (1975), *Adjunct Associate Professor*, Department of Environmental and Forest Biology; B.S., Central Connecticut State, 1959; M.S., 1964; Ph.D., University of Connecticut, 1968

ALFRED H. NISSEN (1979), *Adjunct Professor*, Department of Paper Science and Engineering; B.Sc., Birmingham University, 1937; Ph.D., 1940; D. Sc., 1943

ROGER L. NISSEN, JR. (1971), *Technical Assistant*, School of Forestry; A.A.S., Paul Smith's College, 1970

BARRY R. NOON (1980), *Adjunct Research Associate*; Department of Environmental and Forest Biology; B.A., Princeton University, 1971; Ph.D., State University of New York at Albany, 1977

ROBERT S. NORTH (1975), *Registrar*, Office of the Vice President for Student Affairs; A.B., Syracuse University, 1952

ROY A. NORTON (1970), *Research Associate*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1969; M.S., 1973; Ph.D., 1977

JOHN D. NOVADO (1967), *Editorial Associate*, Office of Publications; B.A., Syracuse University, 1965

RALPH D. NYLAND (1967), *Associate Professor*, School of Forestry; B.S., State University of New York College of Forestry, 1958; M.S., 1959; Ph.D., Michigan State University, 1966

SHEILA O'ROURKE (1979), *Assistant to the Vice President for Student Affairs*, Office of Student Affairs; A.A., Cape Cod Community College, 1974; B.A., University of Massachusetts, 1976; M.Ed., Suffolk University, 1979

DONALD A. PAFKA (1967), *Technical Assistant*, School of Forestry; A.A.S., State University of New York Agricultural and Technical College at Morrisville, 1956; State University of New York College of Forestry (Ranger School), 1966

CARL E. PALM, JR. (1972), *Technical Assistant*, School of Forestry; A.A.S., Paul Smith's, 1972

DAVID G. PALMER (1966), *Associate Professor*, Department of Forest Engineering; Graduate Program in Environmental Science; B.S., General Motors Institute, 1962; M.S., Syracuse University, 1964; Ph.D., 1975

EDWARD E. PALMER (1969), *President*; A.B., Middlebury College, 1939; Ph.D., Syracuse University, 1949

JAMES F. PALMER (1980), *Assistant Professor*, School of Landscape Architecture; B.A., University of California, 1972; M.L.A., University of Massachusetts, 1976; Ph.D., 1979

ANTHONY PANABIANCO (1979), *Adjunct Member*, Employee Performance Evaluation Program Appeals Board; B.S., Marquette University, 1969; M.S., State University of New York at Binghamton, 1980

CHARLES M. PARKINSON, JR. (1980), *Technical Assistant*, Department of Environmental and Forest Biology; B.S., Le Moyne College, 1975; M.S., State University of New York College of Environmental Science and Forestry, 1980

ANGELOS V. PATSIS (1979), *Adjunct Professor*, Department of Chemistry; *Associate Director for Continuing Education of the Polymer Research Institute*; B.S., Athens University, 1954; M.S., Case-Western Reserve, 1958; Ph.D., 1959

BRUCE PATTERSON (1978), *Technical Assistant*, Computer Center; B.A., State University of New York at Oswego, 1974

BHALCHANDRA PATWARDHAN (1979), *Research Associate*, School of Biology, Chemistry and Ecology; B.S., Nagpur University, 1967; M.S., 1969; Ph.D., 1973

THOMAS A. PAULO (1974), *Associate Professor*, School of Landscape Architecture; Graduate Program in Environmental Science; A.B., New York University, 1968; J.D., 1971; M.L.A., State University of New York College of Environmental Science and Forestry, 1974

HARRISON H. PAYNE (1964), *Vice President for Student Affairs; Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1950; M. Ed., St. Lawrence University, 1955; Ed. D., Cornell University, 1963

RICHARD W. PERO (1980), *Technical Assistant*, Department of Paper Science and Engineering; B.S., St. John Fisher College, 1970

JANIS PETRICEKS (1968), *Professor*, School of Forestry; Diploma in Forestry, University of Freiburg, 1950; M. Agr., Interamerican Institute of Agricultural Sciences, 1956; Ph.D., State University of New York College of Forestry, 1968

GUY PIROLLA (1979), *Technical Assistant*, Department of Chemistry, B.S., State of New York College of Environmental Science and Forestry, 1963

JOHN C. POLICASTRO (1978), *Technical Assistant*, School of Forest Technology; A.A.S., State University of New York College of Environmental Science and Forestry, 1977

JACOBUS B. POOT (1967), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services

WILLIAM F. PORTER (1978), *Assistant Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; *Acting Director*, Adirondack Ecological Center; B.S., University of Northern Iowa, 1973; M.S., University of Minnesota, 1976; Ph.D., 1979

DONALD POTTS (1978), *Adjunct Assistant Professor*, School of Forestry; B.A., State University of New York at Buffalo, 1972; M.S., State University of New York College of Environmental Science and Forestry, 1976; Ph.D., 1978

ROBERT B. RAYMISH (1956), *Assistant Director of Physical Plant*, Office of the Vice President for Administration and Services

DUDLEY J. RAYNAL (1974), *Associate Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., Clemson University, 1969; Ph.D., University of Illinois, 1974

THOMAS B. REAGAN (1971), *Television Engineer*, Educational Communications Section, Office of the Vice President for Administration and Services

BRUCE E. REICHEL (1974), *Director of Physical Plant*, Office of the Vice President for Administration and Services; B.S., State University of New York College of Environmental Science and Forestry, 1973

ROBERT G. REIMANN (1962), *Dean and Professor*, School of Landscape Architecture; B.S., State University of New York College of Forestry, 1954

KERMIT E. REMELE (1962), *Associate Professor*, School of Forest Technology; State University of New York College of Forestry (Ranger School), 1943; B.S., State University of New York College of Forestry, 1949; M.F., University of Michigan, 1952

NORMAN A. RICHARDS (1963), *Professor*, School of Forestry; B.S., State University of New York College of Forestry, 1957; M.S., Cornell University, 1959; Ph.D., State University of New York College of Forestry, 1968

NEIL H. RINGLER (1975), *Associate Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., California State University at Long Beach, 1967; M.S., Oregon State University, 1970; Ph.D., University of Michigan, 1975

JOHN K. ROBERTSON (1978), *Adjunct Professor*, Graduate Program in Environmental Science; B.S., City College of New York, 1966; M.B.A., Long Island University, 1976; M.S., University of Chicago, 1968; Ph.D., 1970

KATHERINE P. ROSSI (1966), *Associate Librarian*, F. Franklin Moon Library; B.A., William Smith College, 1945; M.S.L.S., Syracuse University, 1966

SAMUEL ROTHENBERG (1946), *Research Associate*, Empire State Paper Research Institute; B.S., State University of New York College of Forestry, 1943; M.S., 1964

ROWAN A. ROWNTREE (1977) *Adjunct Associate Professor*, Graduate Program in Environmental Science; B.A. (hons.) California State University, 1966; M.S., University of California, Berkeley, 1970; Ph.D., 1973

DIANE E. RUESS (1980), *Assistant Librarian*, F. Franklin Moon Library; B.S., University of North Dakota, 1975; M.L.S., University of Washington, 1979

RICHARD W. SAGE, JR. (1970), *Research Assistant and Program Coordinator*, Adirondack Ecological Center; B.S., State University of New York College of Forestry, 1966

RALPH A. SANDERS (1979), *Adjunct Associate Professor*, School of Forestry, Graduate Program in Environmental Science; B.A., Dartmouth College, 1963; M.A., Pennsylvania State University, 1967; Ph.D., University of Minnesota, 1974

ANATOLE SARKO (1967), *Professor*, Department of Chemistry; *Associate Member*, Polymer Research Institute; B.S., Upsala College, 1952; M.S., New York University, 1960; Ph.D., State University of New York College of Forestry, 1966

PETER SARKO (1980), *Technical Assistant*, Department of Paper Science and Engineering

JOHN H. SCHACHTE (1980), *Adjunct Assistant Professor*, Department of Environmental and Forest Biology; B.S., Clemson University, 1963; M.S., Auburn University, 1972; Ph.D., 1976

MICHAIL SCHAEDLE (1965), *Associate Professor*, Department of Environmental and Forest Biology; B.S., University of British Columbia, 1957; M.S., 1959; Ph.D., University of California, 1964

CONRAD SCHUERCH (1949), *Distinguished Professor*, Department of Chemistry; *Associate Member*, Polymer Research Institute; B.S., Massachusetts Institute of Technology, 1940; Ph.D., 1947

RICHARD A. SCHWAB (1976), *College Forest Property Manager*, Office of the Vice President for Administration and Services; B.S., State University of New York College of Environmental Science and Forestry, 1969

VINCENT SCICCHITANO (1979), *Adjunct Member*, Employee Performance Evaluation Program Appeals Board; B.S., LeMoyne College, 1957

RONALD J. SCRUDATO (1980), *Adjunct Professor*, Institute of Environmental Program Affairs; B.S., Clemson University, 1962; M.S., Tulane University, 1964; Ph.D., University of North Carolina, 1969

PATRICK E. SHARPE (1978), *Technical Assistant*, Department of Paper Science and Engineering; B.S., Rochester Institute of Technology, 1974

WILLIAM SHIELDS (1979), *Assistant Professor*, Department of Environmental and Forest Biology; A.B., Rutgers University, 1974; M.S., Ohio State University, 1976; Ph.D., 1979

JOHN F. SIAU (1963-64) (1965) (1966), *Professor*, Department of Wood Products Engineering; B.S., Michigan State University, 1943; M.S., State University of New York College of Forestry, 1965; Ph.D., 1968

ROBERT M. SILVERSTEIN (1969), *Professor*, Department of Chemistry; B.S., University of Pennsylvania, 1937; M.S., New York University, 1941; Ph.D., 1949

JOHN B. SIMEONE (1948), *Professor*, Department of Environmental and Forest Biology; B.S., Rhode Island State College, 1942; M.F., Yale University, 1948; Ph.D., Cornell University, 1960

THOMAS O. SLOCUM (1977), *Director of Counseling*, Office of the Vice President for Student Affairs; B.S., State University of New York at Brockport, 1967; M.S., State University of New York at Albany, 1968

RICHARD C. SMARDON (1979), *Research Associate*, School of Landscape Architecture; Graduate Program in Environmental Science; B.S., University of Massachusetts, 1970; M.S., 1973

JOHANNES SMID (1956-57) (1960), *Professor*, Department of Chemistry; *Associate Member*, Polymer Research Institute; B.Sc., Free University of Amsterdam, 1952; M.Sc., 1954; Ph.D., State University of New York College of Forestry, 1957

JERI LYNN SMITH (1977), *Editorial Associate*, Community Relations; B.A., Syracuse University, 1975

KENNETH J. SMITH, JR. (1968), *Professor and Chairman*, Department of Chemistry; Graduate Program in Environmental Science; *Acting Director*, Polymer Research Institute; B.A., East Carolina University, 1957; M.A., Duke University, 1959; Ph.D., 1962

LEONARD A. SMITH (1964), *Assistant Professor*, Department of Wood Products Engineering; *Associate Member*, Polymer Research Institute; B.S., Ch.E., University of Dayton, 1962; M.S., Ch.E., Case Institute of Technology, 1964; Ph.D., State University of New York College of Environmental Science and Forestry, 1972

M. COLLEEN SNOW (1980), *Research Associate*, School of Forestry, B.A., Scripps College, 1972

GEORGE A. SNYDER (1970), *Technical Specialist*, Educational Communications Section, Office of the Vice President for Administration and Services

DAVID J. SODERBERG (1979), *Technical Specialist*, Administrative Data Processing; B.A., State University of New York at Oneonta, 1975; B.S., State University of New York College of Environmental Science and Forestry, 1979

FRANCIS M. SOLAN (1974), *Technical Assistant*, School of Forestry; A.A.S., State University of New York at Morrisville, 1971

BRIAN M. SPEER (1964), *Director of Campus Security*, Office of the Vice President for Administration and Services; A.A.S., Mohawk Valley Community College, 1975; B.P.S. in Policy Administration, State University of New York College of Technology at Rome, 1979

VINAI K. SRIVASTAVA (1978), *Research Associate*, Department of Chemistry, B.S., Lucknow University, India, 1968; B.S. (Hons.), 1969; M.S., 1970; Ph.D., Gujarat University, India, 1974

KAREN A. STARWOOD (1980), *Technical Assistant*, Department of Environmental and Forest Biology; B.S., State University of New York at Oswego, 1976

GEORGE H. STAUFFER (1979), *Research Associate*, School of Forestry; B.A., University of California, 1964; M.S., 1978

THEODORE J. STENUF (1960), *Distinguished Teaching Professor*, Department of Paper Science and Engineering; B.Ch.E., Syracuse University, 1949; M.Ch.E., 1951; Ph.D., 1953

JOHN J. STERBENZ (1973), *Assistant Professor*, School of Forest Technology; State University of New York College of Forestry (Ranger School), 1966; B.S., University of Michigan, 1970; M.F., 1972

ABIGAIL STERN (1978), *Technical Assistant*, School of Forestry, B.S., Geology, University of Rochester, 1973

S. ALEXANDER STERN (1979), *Adjunct Professor*, Department of Chemistry; *Associate Member*, Polymer Research Institute; B.S., Israel Institute of Technology, 1945; M.S., Ohio State University, 1948; Ph.D., 1952

JACK C. STEVENS (1980), *Technical Assistant*, School of Forestry; B.S., State University of New York College of Environmental Science and Forestry, 1977

WILLIAM M. STITELER (1973), *Professor*, School of Forestry, Graduate Program in Environmental Science; B.S., Pennsylvania State University, 1964; M.S., 1965; Ph.D., 1970

DENNIS O. STRATTON (1978), *Associate Director of Admissions*, Admissions Office; B.S., State University of New York at Cortland, 1966; M.S., 1967

RICHARD H. SUGATT (1980), *Adjunct Assistant Professor*, Department of Environmental and Forest Biology; B.A., Wesleyan University, 1971; M.S., New York University, 1973; Ph.S., University of New Hampshire, 1978

WESLEY E. SUHR (1974), *Associate Professor*, School of Forest Technology; B.S., University of Minnesota, 1958; M.S., University of Arizona, 1965

DANIEL A. SUNDQUIST (1979), *Assistant Professor*, School of Landscape Architecture, B.L.A., State University of New York College of Environmental Science and Forestry, 1970

PAUL SZEMKOW (1978), *Technical Assistant*, Department of Paper Science and Engineering, Department of Forest Engineering; B.S., Empire State College, 1976

DAVID W. TABER (1970), *Adjunct Extension Specialist*, School of Forestry; B.S., University of Maine, 1961; M.S., 1968

STUART W. TANENBAUM (1973), *Dean and Professor*, School of Biology, Chemistry and Ecology; B.S., City College of New York, 1944; Ph.D., Columbia University, 1951

HERBERT B. TEPPER (1962), *Professor*, Department of Environmental and Forest Biology; B.S., State University of New York College of Forestry, 1953; M.S., 1958; Ph.D., University of California, 1962

FRED C. TERRACINA (1975), *Research Associate*, Department of Environmental and Forest Biology; B.A., Harpur College, 1964; M.A., State University of New York at Binghamton, 1969; Ph.D., State University of New York College of Environmental Science and Forestry, 1976

ROGER C. THOMPSON (1975), *Adjunct Professor*, Graduate Program in Environmental Science; B.S., State University of New York College of Forestry, 1951; M.S., Syracuse University, 1952; Ph.D., State University of New York College of Forestry, 1961

JAMES L. THORPE (1965), *Research Associate*, Empire State Paper Research Institute; B.S., State University of New York College of Forestry, 1965; M.S., 1967

WILLIAM C. TIERSON (1949), *Senior Research Associate*, Adirondack Ecological Center; B.S., State University of New York College of Forestry, 1949; M.F., 1967

TORE E. TIMELL (1962), *Professor*, Department of Chemistry; *Director*, Cellulose Research Institute; *Associate Member*, Polymer Research Institute; Civiling., Royal Institute of Technology, Stockholm, 1946; Tekn. lic., 1948; Dr. Technology, 1950

VIRGINIA TORELLI (1975), *Adjunct Foreign Student Counselor*, Office of the Vice President for Student Affairs; B.A., Syracuse University, 1944

R. GARY TREGASKIS (1969), *Technical Specialist*, Educational Communications Section, Office of the Vice President for Administration and Services; A.A.S., Broome Community College, 1967

WILLIAM P. TULLY (1966), *Dean and Professor*, School of Environmental and Resource Engineering; Graduate Program in Environmental Science; B.S., C.E., Northeastern University, 1964; M.S., C.E., 1966; Ph.D., Syracuse University, 1978

LESLIE L. TURAI (1976), *Professor*, Department of Paper Science and Engineering; Graduate Program in Environmental Science; B.S., University of Debrecen, 1936; M.S., 1937; Ph.D., University of Budapest, 1938

JOHN E. UNBEHEND (1972), *Research Assistant*, Empire State Paper Research Institute; A.A.S., Onondaga Community College, 1966; B.S., State University of New York College of Forestry, 1969; M.S., 1975

BETSY L. VAN DER VEER (1981), *Assistant for Sponsored Programs*, Office of Research Programs; B.A., Loretto Heights College, 1975; M.L.S., Syracuse University, 1978

FREDRICK A. VALENTINE (1956), *Professor*, Department of Environmental and Forest Biology; B.S., St. Cloud State Teachers College, 1949; M.S., University of Wisconsin, 1953; Ph.D., 1957

LARRY W. VAN DRUFF (1970), *Associate Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., Mansfield State College, 1964; M.S., Cornell University, 1966; Ph.D., 1970

DAVID L. VANTRESS (1979), *Assistant Director* of Physical Plant for Facilities; B.S., State University of New York College of Environmental Science and Forestry, 1976

RAMESH C. VASISHTH (1975), *Adjunct Professor*, Department of Wood Products Engineering; Ph.D., University of Washington, 1960

DONNA C. VAVONESE (1978), *Assistant Director of Admissions*, Admissions Office; B.S., State University of New York at Oswego, 1971

JOHN E. VIEW (1979), *Director of Financial Aids*, Office of the Vice President for Student Affairs; B.A., St. Leo College, 1972; M.A., University of Notre Dame, 1974

DANIEL C. WALTON (1963), *Professor*, Department of Environmental and Forest Biology; B.Ch.E., University of Delaware, 1955; Ph.D., State University of New York College of Forestry, 1962

CHUN-JUAN WANG (1959), *Professor*, Department of Environmental and Forest Biology; B.S., Taiwan University, 1950; M.S., Vassar College, 1952; Ph.D., State University of Iowa, 1955

DONALD F. WEBSTER (1973), *Director of Libraries*, F. Franklin Moon Library; Graduate Program in Environmental Science; B.A., Hofstra University, 1959; M.L.S. and Diploma in Library Education, Queens College, 1965

JOHN A. WEEKS (1977), *Adjunct Professor*, School of Forestry; Graduate Program in Environmental Science; B.S., Cornell University, 1949; M.S., Syracuse University, 1959

ROBERT G. WERNER (1966-69) (1970), *Professor*, Department of Environmental and Forest Biology; Graduate Program in Environmental Science; B.S., Purdue University, 1958; M.A., University of California, 1963; Ph.D., Indiana University, 1966

JANET R. WEST (1972), *Technical Assistant*, Department of Chemistry; B.S., State University of New York at Oswego, 1965

CHRISTOPHER WESTBROOK (1980), *Technical Assistant*, School of Forest Technology; B.S., University of Montana, 1977

LAWRENCE W. WHELPTON (1969), *Technical Specialist*, Department of Environmental and Forest Biology; A.A.S., State University of New York Agricultural and Technical College at Alfred, 1965

EDWIN H. WHITE (1980), *Professor*, School of Forestry; B.S., State University of New York College of Environmental Science and Forestry, 1962; M.S., 1964; Ph.D., Auburn University, 1969

HUGH E. WILCOX (1951), *Professor*, Department of Environmental and Forest Biology; B.S., University of California, 1938; M.S., New York State College of Forestry, 1940; Ph.D., University of California, 1950

DAVID E. WILKINS (1966), *Technical Specialist*, Analytical and Technical Services, Office of the Vice President for Administration and Services

JAMES L. WILLIAMSON (1980), *Associate Librarian*, F. Franklin Moon Library; B.A., State University of New York at Albany, 1971; M.L.S., 1973

PETER F. WILTSIE (1968), *Assistant Director of Business and Fiscal Affairs*, Office of the Vice President for Administration and Services; A.B., Utica College of Syracuse University, 1965

MARILYN L. WRIGHT (1974), *Assistant to the Director of Financial Aids*, Office of the Vice President for Student Affairs

JOHN M. YAVORSKY (1948-56) (1967), *Dean and Professor*, School of Continuing Education; B.S., State University of New York College of Forestry, 1942; M.S., 1947; Ph.D., 1955

ROBERT A. ZABEL (1947), *Professor*, Department of Environmental and Forest Biology; B.S., University of Minnesota, 1938; M.S., State University of New York College of Forestry, 1941; Ph.D., 1948

EMERITUS

ERIC A. ANDERSON (1950-1975), *Professor Emeritus*; B.Sc.F., University of Washington, 1932; Ph.D., State University of New York College of Forestry, 1949

GEORGE R. ARMSTRONG (1950), *Professor Emeritus*; B.S., State University of New York College of Forestry, 1949; M.S., 1959, Ph.D., 1965

LAWRENCE J. BELANGER (1947-1965), *Registrar Emeritus*; *Professor Emeritus*; B.S., Syracuse University, 1932; M.S., New York State College for Teachers, Albany, 1941

FLOYD E. CARLSON (1930-1969), *Professor Emeritus*; B.S.F., University of Washington, 1928; M.F., 1930

DANIEL M. CASTAGNOZZI (1956-1977), *Professor and Director Emeritus*; A.A.S., State University of New York College of Forestry (Ranger School), 1950; B.S.F., University of Michigan, 1952; M.F., State University of New York College of Forestry, 1957

RUSSELL C. DECKERT (1952-1976), *Professor Emeritus*; B.S.F., University of Georgia, 1938; M.F., Duke University, 1943

JAMES F. DUBUAR (1919-1957), *Director Emeritus, Ranger School; Professor Emeritus;* A.B., University of Michigan, 1913; M.S.F., 1915

C. EUGENE FARNSWORTH (1930-1972), *Professor Emeritus;* B.S.F., Iowa State College, 1926; M.F., Yale University, 1928; Ph.D., University of Michigan, 1945

JEAN E. FISHER (1950-52) (1963), *Senior Research Associate Emeritus*, B.S., University of Idaho, 1941

CARL C. FORSAITH (1917-1959), *Professor Emeritus*; B.A., Dartmouth College, 1913; M.A., Harvard University, 1914; Ph.D., 1917

RUSSELL E. GETTY (1966-1973), *Professor Emeritus*; B.S., Iowa State College, 1936; M.S., 1951

DONALD F. GREEN (1965-1978), *Registrar Emeritus*; A.B., New York State College for Teachers, Albany, 1942; M.S., 1950

GEORGE H. HAINES (1953-1968), *Director of Business Affairs Emeritus*; B.S., University of Rhode Island, 1932

WILLIAM M. HARLOW (1928-1965), *Professor Emeritus*; B.S., New York State College of Forestry, 1925; M.S., 1926; Ph.D. 1928

RAY R. HIRT (1921-1959), *Senior Professor Emeritus*; B.S., Hamline University, 1917; M.S., New York State College of Forestry, 1924; Ph.D., 1928

RAYMOND J. HOYLE (1918-1957), *Professor Emeritus*; B.S., New York State College of Forestry, 1917; M.S., Syracuse University, 1930

EDWIN C. JAHN (1938-1972), *Dean Emeritus*; *Professor Emeritus*; B.S., New York State College of Forestry, 1925; M.S., 1926; Ph.D., McGill University, 1929

THEODORE J. KOCHANEK (1971-1976), *Director of Physical Plant Emeritus*

RICHARD W. LALOR (1953-1976), *Associate Professor Emeritus*; B.S., New York State College for Teachers, 1941; A.M., Cornell University, 1946

ORRIN L. LATHAM (1930-1966), *Associate Professor Emeritus*; B.S.F., Iowa State College, 1927; Yale University, 1932

JOSIAH L. LOWE (1933-1975), *Professor Emeritus*; B.S., New York State College of Forestry, 1927; Ph.D., University of Michigan, 1938

AUBREY H. MACANDREWS (1926-1962), *Professor Emeritus*; Truro Agriculture College, 1922; B.S., New York State College of Forestry, 1925; M.S., 1926

RENATA MARTON (1957), *Senior Research Associate Emeritus*, Master Ph. (Chemistry), Jagiello University, 1934; Ph.D., 1936

JOHN L. MORRISON (1946-1971), *Professor Emeritus*; A.B., University of Nebraska, 1933; A.M., 1935; Ph.D., University of California, 1941

FREDERIC W. O'NEIL (1937-1974), *Professor Emeritus*; B.S., New York State College of Forestry, 1933; M.S., 1935

RICHARD E. PENTONEY (1953-1979), *Vice President for Program Affairs Emeritus*; B.S., University of California, 1949; M.S., State University of New York College of Forestry, 1952; Ph.D., 1956

LUCIAN P. PLUMLEY (1936-1967), *Director Emeritus*, Ranger School; *Professor Emeritus*; New York State College of Forestry, (Ranger School), 1931; B.S.,New York State College of Forestry, 1935

SHELLEY W. POTTER, JR. (1956-1979), *Forest Property Manager Emeritus*; B.S., University of Michigan, 1951

BRADFORD G. SEARS (1941-1976), *Dean Emeritus*; *Professor Emeritus*; B.S., New York State College of Forestry, 1939; M.S., 1948

HARDY L. SHIRLEY (1945-1967), *Dean Emeritus*; *Professor Emeritus*; B.A., Indiana University, 1922; Ph.D., Yale University, 1928; D.h.c., University of Helsinki, 1958; D.Sc., Syracuse University, 1966

SAVEL B. SILVERBORG (1947-1977), *Professor Emeritus*; B.S., University of Idaho, 1936; Ph.D., 1968

CHRISTEN SKAAR (1946-1948) (1949-1976), *Professor Emeritus*; B.S., New York State College of Forestry, 1943; M.S., 1948; Ph.D., Yale University, 1957

GERALD H. SMITH (1946-1979), *Professor Emeritus*; B.S., New York State College of Forestry, 1937; M.B.A., Syracuse University, 1956

LEROY C. STEGEMAN (1929-1965), *Professor Emeritus*; B.S., Michigan State College, 1928; M.S., University of Michigan, 1929

VIVIAN R. SUTTON (1962-1976), *Associate Professor Emeritus*; B.A., Oberlin College, 1934; M.A., Bryn Mawr College, 1937; Ph.D., 1942

MICHAEL M. SZWARC (1952-1979), *Leading Professor Emeritus*; Ch.E., Warsaw Polytechnic College, 1932; Ph.D., Hebrew University, 1945; Ph.D., Manchester University, 1947; D.Sc., 1949

ARTHUR T. VIERTEL (1946-1975), *Associate Professor Emeritus*; B.S., New York State College of Forestry, 1942; Ph.D., 1954

WILLIAM L. WEBB (1937-1975), *Professor Emeritus*; *Dean Emeritus*; B.S., University of Minnesota, 1935; M.S., 1940; Ph.D., Syracuse University, 1950

FAY WELCH (1932-1967), *Lecturer Emeritus*; B.S., New York State College of Forestry, 1922

WALTER L. WELCH (1950-1965), *Associate Professor Emeritus*; A.B., Syracuse University, 1946

SIDNEY A. WHITT (1968-1976), *Professor Emeritus*; B.S., University of Alabama, 1933; M.S., Massachusetts Institute of Technology, 1937; D. Engr. Sc., New York University, 1962

HAROLD G. WILM (1953-1966), *Professor Emeritus*; *Associate Dean Emeritus*; B.S., Colorado College, 1929; M.F., Cornell University, 1930; Ph.D., 1932

Index

Academic Life 23
Academic Policies.....................37
—Undergraduate 38
—Graduate 40
Activities, Extracurricular 46
Adirondack Ecological Center 13, 18
Administration, College 191
Admission
—Advanced Early...................24
—Undergraduate 24
—Graduate 27
—School of Forest Technology 127
Assistantships, Graduate 37
Athletics 47
Attendance, Class 37
Audits 37
Biology, Chemistry and Ecology,
School of 52
Biology, Environmental and
Forest 52, 57, 144
Board of Trustees
—ESF 190
—SUNY 187
Botany 146
Calendar, Academic...................3
Campuses, Regional System of ... 15,17-18
Career Services 48
—School of Forest Technology 130
Cellulose Research Institute 14
Chemical Ecology.....................71
Chemistry 65, 150
—Biochemistry and Natural Products
Option 67
—Environmental Chemistry Option 67
—Natural and Synthetic Polymer
Option 68
Clubs and Organizations...............46
College Proficiency Examinations 26
Commencement
—Fees 30
—Honors 39
Computer Center 17
Continuing Education 9, 181
Cooperative Research Unit,
USDA Forest Service 14
Cornell University 131
Counseling
—Academic and Personal.............48
—Career 48
—Health 49
Course Offerings 133
Cranberry Lake Campus 18, 57
Credit Hour Load................. 38, 41
Correspondence .... Inside Front Cover
Degree Programs 51
Degree Requirements
—Undergraduate 37
—Graduate 42
Dual Program 117
Dubuar Forest 17
Ecology......................... 57, 61
Economics, Forestry 95
Educational Communications Unit 16
Educational Opportunity Program.......26
—EOP Grants.......................33
Ellis International Laboratory 19
Empire State Paper Research Institute 11, 15
Employment 36
Energy Conservation 124
Engineering 137
—Forest Engineering 74, 155
—Paper Science and Engineering 78
—Wood Products Engineering.........82
Entomology 56, 61, 157
Environmental
—and Forest Biology 52, 59
—and Resource Engineering,
School of 72
—Assessment 123
—Biology Summer Program...........57
—Education/Communications 123
—Influences 135
—Land Use Planning 124
—Physiology 62
—Policy 122
—Program Affairs, Institute of .. 11, 14, 15
—Science, Graduate Program in . 119, 136
—Studies 105, 143
Exchange Programs 131
Expenses 28
—School of Forest Technology 129
Experiment Station 19
Extracurricular Activities...............46
Faculty, College 192
Faculty Emeritus.....................207
Failures and Incompletes 39
Fees
—Application........................28
—Advanced Payment 29
—Commencement 30
—Refunds 31
—Student Activity 30
Fellowships 35
Field Forestry Summer Program 55, 57
Financial Assistance 32
Fish and Wildlife Biology........... 56, 62
Food Service 46
Forest
—Biology 52, 59
—Ecosystem Lab 17

—Engineering 74, 149
—Influences 99, 101
—Management 94
—Pathology and Mycology 56
—Technology, School of 125, 164
Forestry 159
—Economics 95
—International 101
—School of 88
—Urban 102
Genetic Field Station 17, 19
Grades/Grade Point Average 38
Grant Programs 33, 35
Graduation Requirements
—Undergraduate 40
—Graduate 45
Graphics 164, 170
Health and Medical Services 49
—Health Examination Board 27
Heiberg Memorial Forest 17
History and Traditions, College 5
Honors, Academic 39
Housing and Board 46
—Cost of 30
Huntington Wildlife Forest 18
Institute of Environmental
Program Affairs 11, 14, 15
Instruction
—Continuing Education 9
—Graduate 8
—Professional 8
—Technical 8
Insurance, Health and Accident 49
Interdepartmental Areas of Study .. 71, 119
International Forestry 101
International Students
—Undergraduate 27
—Graduate 28
—Tuition Waivers 34
Landscape Architecture, School of 103, 171
Land Use Planning 124
Library 16, 171
—Film Library 14
Loans 36
Management 159
—Forest 94
—Policy and Resource 93
—Recreation 95
—Resources 89
Mathematics 134
Medical Services 49
Newcomb Campus 13, 15, 18
Pack Demonstration Forest 18
Paper Science and Engineering 78, 177
Pathology, Forest 56, 63
Pest Management 57
Physiology, Environmental 62
Placement 48, 130
Plant Science 56, 63
Policy and Administration 94
Polymer Research Institute 12, 15
Probation 38
Professional Staff 192
Public Service 14
Quantitative Methods 102
Recreation Management 95
Refunds 31
Regents Programs 34
Renewable Materials Institute 13
Research 10
Resources Management 89, 159
Resource Management and
Policy 93, 179
ROTC Program 50
Scholarships and Grants 33
Silvics 57, 99
Silviculture 99, 182
Silviculture and Forest Influences 97
Social Security Benefits 35
Soil
—Ecology 61
—Science 100
State University of New York 187
Student Life 46
Summer Field Programs 55, 57
—Cost of 31
Syracuse Campus, ESF 15
Syracuse Metropolitan Area 21
Syracuse University
—Counseling 48
—Health and Medical Facilities 49
—Housing and Board 30, 46
—Student Organizations 47
Transfer Students
—Admissions 25
—Credit 26
Tree Improvement 101
Tree Pest, Disease Service 14
Tropical Timber Information Center 13
Tuition and Fees 29
—Refunds 31
—School of Forest Technology 129
Tuition Assistance Program 34
Tully Campus 17
Ultrastructure Studies Lab,
N.C. Brown 12, 15
Urban Forestry 102
USDA Forest Service Cooperative
Research Unit 14
Veterans' Benefits 35
Vocational Rehabilitation Grants 34
Wanakena Campus 17, 126
Warrensburg Campus 18
—Summer Session 55
Water Resources 123
Wellesley Island 19
Wildlife Biology 56, 62
Wood Products Engineering 82, 184
—Building Construction Option 83
—Forest Products Option 85
Work-Study Program 36
Zoology 56, 64, 167

Campus Locator

Admissions	110 Bray
Affirmative Action	218 Bray
Alumni	119 Bray
Analytical and Technical Services	139 Baker
Assistant Vice President for Academic Programs	227 Bray
Assistant Vice President for Research	200 Bray
Auto-tutorial Center	16 Moon
Business and Fiscal Affairs	100 Bray
Career Services	108 Bray
Cellulose Research Institute	314 Baker
Community Relations	123 Bray
Computer Services	320 Baker
Counseling Services	107 Bray
Educational Communications	302 Illick
Empire State Paper Research Institute	317 Walters
Facilities	Maintenance Building
Film Library	9 Moon
Financial Aid	111 Bray
International Forestry	205 Marshall
Institute of Environmental Program Affairs	200 Bray
Institutional Research	206 Bray
Library	101 Moon
Maintenance and Operations	Maintenance Building
Personnel	224 Bray
Polymer Research Institute	215 Baker
President	204 Bray
Publications	123 Bray
Registrar	113 Bray
School of Biology, Chemistry and Ecology	311 Baker
School of Continuing Education	231 Baker
School of Environmental and Resource Engineering	208 Walters
School of Forestry	106 Marshall
School of Landscape Architecture	331 Marshall
Security and Safety	8 Bray
Student Council	19 Marshall
Ultrastructure Studies Center	417 Baker
U.S. Forest Service Cooperative Research Unit	5 Moon
Veterans' Affairs	107 Bray
Vice President for Administration and Services	208 Bray
Vice President for Program Affairs	227 Bray
Vice President for Student Affairs	107 Bray

Coordinator for 503-504 Programs at the State University of New York College of Environmental Science and Forestry is David G. Anderson, Vice President for Administration and Services.

COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY
SYRACUSE, NEW YORK 13210

NON-PROFIT ORG.
U.S. POSTAGE
PAID
SYRACUSE, N.Y.
PERMIT NO. 248

Robert S. North
Registrar