State University of New York
College of Environmental Science and Forestry

Department of Paper and Bioprocess Engineering

Graduate Student Handbook Supplement

Degree Program Options:

PBE - **Bioprocess Engineering** (MPS, MS, PhD)
PBE - **Biomaterials Engineering** (MS, PhD)
PBE - **Paper Science and Engineering** (MPS, MS, PhD)
PBE: **Sustainable Engineering Management** (MPS): PSM-PSE, PSM-BPE
CM&WPE - **Wood Science** (MPS, MS, PhD)

Non-Degree Programs:

Advanced Certificate in Bioprocessing
Advanced Certificate in Radiation Curing

August 15, 2017

Revision History

V1.00 August 15, 2017 Paper and Bioprocess Engineering, Wood Products

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Introduction to the Graduate Student Handbook

This handbook provides important information concerning the policies, regulation, and practices of the Department of Paper and Bioprocess Engineering at the State University of New York – College of Environmental Science and Forestry. It also contains additional information for students regarding advising, registration, and petitions.

The department currently has one graduate program (Paper and Bioprocess Engineering, or in short PBE) and shares another program (Construction Management and Wood Products Engineering, or CM&WPE in short). Most of our areas of studies are in PBE, only one in Construction Management and Wood Products Engineering (CM&WPE). At the writing of this handbook, Wood Science option (or Wood Science study area of CM&WPE) for any degree programs (MPS, MS or PhD) has not been well defined.

It is important to remember that the official requirements for the graduate degrees are given in the *State University of New York, College of Environmental Science and Forestry General Catalog* for the year in which the student entered the college. Those are the requirements that must be met in order to graduate. This handbook serves to clarify some of the items in the catalog and give the student additional information regarding the curriculum and the Department.

This handbook is a work in progress and is expected to improve in the following years. This first version is based on the Handbook written by Professor Bandaru V. Ramarao, MPS program information provided by Professor Gary M. Scott, and the ESF College Catalog online regarding the respective programs / curricula. Effort has been made to eliminate the inconsistencies in the various publications.

Prof. Shijie Liu
Graduate Coordinator

Mission, Program Objectives, and Program Learning Outcomes

The mission of the Department of Paper and Bioprocess Engineering is:

- to develop well-educated and skilled engineers for technical and leadership careers in the pulp, paper, bioconversion, bioenergy, chemical and allied industries;
- to foster the creation of new fundamental knowledge and technology relating to the science, technology and engineering science for the production and utilization of renewable energy, chemicals, and commodity bioproducts, including especially pulp, paper, and associated products;
- to serve as a resource for societal interaction on the broad improving living, environment, resources, and conservation aspects related to the renewable energy, renewable chemicals & bioproducts, pulp, paper, and allied industries, including the development of the biorefinery processes.

To accomplish the educational aspects of this mission, the Department currently offers three graduate programs (MPS, MS and PhD) in three different areas of study (Bioprocess Engineering, Biomaterials, and Paper Science and Engineering), each with their own objectives and learning outcomes.

Flowsheet of Procedures

Milestone	Forms	Timing
Application for admission into a graduate (MPS, MS or PhD) program		
Student is accepted to a graduate program with a temporary Major Professor		
Selection of Major Professor, Field of Study		**Semester 1**
Appointment of Major professor and Steering committee	**Forms 2A**	**Semester 2**
Program of study	**Form 3B**	**Semester 2**
Revisions to form 3B	**Form 4**	
Request to Appoint PhD Candidacy Exam Committee and Chair (PhD only)	*Form 6B*	*18 months prior to graduation*
Request to Appoint Thesis Exam Committee and Chair (MS or PhD)	Form 5B	
Thesis Proposal	Thesis Proposal Form	
CAPSTONE seminar (MS or PhD)		
Defense of thesis exam (MS or PhD)	Form 5E	
Academic requirements completed (MS or PhD)	Form 9	
Student submits 4+ copies of completed, signed thesis (MS or PhD)	Microfilm. Diploma form, and fees	
Commencement and convocation		

1. Graduate Degree Programs and Minimum Requirements

Currently, the department offers three graduate degree programs, MPS, MS and PhD, all in one program of study, Paper and Bioprocess Engineering. Within the program of study, there are five area of studies (or options, not all are offered with a MPS, MS or PhD degree):

- Biomaterials Engineering (BME), an area of study in PBE
- Bioprocess Engineering (BPE), an area of study in PBE
- Paper Science and Engineering (PSE) , an area of study in PBE
- Sustainable Engineering Management (SEM) , an area of study in PBE
- Wood Science (WS) , an area of study in Construction Management and Wood Products Engineering

Master of Professional Studies or MPS is a non-thesis (terminal) degree program. The program requires 30 credit-hours of course work (500 + level courses), including at least 12 credits (BPE or 15 credits PSE) in the core area of study and at least 3 (and up to 6) credits of Professional experience. The area of study of Sustainable Engineering Management (SEM) is designed to coincide with the nationally recognized Professional Science Master (PSM) program with further options in Bioprocess Engineering (BPE), and Paper Science and Engineering (PSE). The SEM option requires 30 credit-hours of course work (500 + level courses), including at least 12 credits in the core area of study, at least 12 credits of "Plus" courses and at least 3 (and up to 6) credits of Professional experience. The program is aimed at students who wish to switch majors for the perspective of an industrial career. However, students graduating with an MPS degree can choose to continue on with either MS or PhD.

Master of Science or MS is a thesis degree program. The program requires at least 15 credit-hours of course work (600+ level and approved 500 level courses) and at least 6 (and up to 12) credits of thesis research. Course work must contain at least one from each of the core group in Table 1.

Doctor of Philosophy or PhD is a thesis degree program. The program requires at least 30 credit-hours of course work (600+ level and approved 500 level courses) and at least 12 (and up to 30) credits of thesis research. Course work must contain at least one from each of the core group in Table 1 (on page 5).

Table 1. Core courses.

Option or area of Study	Core Course Groups		
	Group A	Group B	Group C
BME	Lignocellulosics Wood Chemistry	Advanced Thermodynamics Interphase and Colloidal Science	Polymer Processing Polymer synthesis Polymer properties
BPE	Biochemistry Lignocellulosics Microbiology Advanced Thermodynamics Interphase and Colloidal Science	Transport Phenomena Bioseparations	Bioprocess Kinetics Reaction Engineering Catalysis
PSE	Lignocellulosics Wood Chemistry Pulping & Bleaching	Papermaking Processes	Paper Properties Paper Physics
SEM	This area of study subdivides into BPE and PSE, which then follow with the core requirements above.		
WS	Wood Science is an area of study in the Construction Management and Wood Products Engineering program		

1.1 The Masters of Professional Studies (M.P.S.) Degree

The program options leading the M.P.S. degree are designed for train students from other fields in the fundamentals related to paper engineering and bioprocess engineering. They are also ideal for engineers and scientists currently working in the industry who wish to retrain and refresh in a new field. The programs can be completed in 3 semesters on a full-time basis, but also can be done on a part-time basis.

The current demand for engineers at the B.S. level indicates that graduates of the M.P.S. program would be in high demand in the near future. Some scholarship support is available from the Syracuse Pulp and Paper Foundation.

The M.P.S. program in the Department of Paper and Bioprocess Engineering has four areas of study (in two programs):

- **Bioprocess Engineering**, an area of study in PBE
- **Paper Science and Engineering**, an area of study in PBE
- **Sustainable Engineering Management**, an area of study in PBE
- **Wood Science**, an area of study in CM&WPE

1.2 M.S. & Ph.D. Degrees

An important component of the M.S. and Ph.D. graduate programs is research under direction of a major professor. Four options are available within this program:

- Biomaterials Engineering (BME), an area of study in PBE
- Bioprocess Engineering (BPE), an area of study in PBE
- Paper Science and Engineering (PSE), an area of study in PBE
- Wood Science (WS), an area of study in CM&WPE

Graduate studies reflect the strong trend toward diversification in the industry and offer opportunities for study in a variety of subjects related to the manufacture of pulp and paper as well as other products, chemicals, and energy from sustainable raw material sources. Individual study programs and research plans are designed to meet specific personal needs.
Many research projects are carried out in cooperation with other College departments. Examples of such projects include a wide-ranging study of toxicity of paper industry effluents in cooperation with the Department of Paper and Bioprocess Engineering, and a cooperative project on the theoretical and experimental analysis of the mechanical properties of fiber and paper with the Department of Mechanical and Aerospace Engineering at Syracuse University. Cooperative studies enable access to the latest equipment in the computer field, including supercomputers.
Examples of inter- and intra-institutional collaborations include the Department of Environmental and Forest Biology and the Department of Chemistry, as well as many industrial cooperators. Cooperative studies enable access to the latest equipment in the computer field, including supercomputers. The department enjoys excellent external support in the form of graduate assistantships, fellowships, and grants from ESPRI, and other industry sources, as well as a number of government granting agencies.
Students can be accepted into the program from a variety of backgrounds. Successful students who have pursued advanced degrees in the Department of Paper and Bioprocess Engineering have had backgrounds in chemical engineering, pulp and paper engineering, civil engineering, mechanical engineering, environmental engineering, chemistry, biological engineering, biology, biotechnology, and manufacturing, among many others. Students planning to obtain graduate degrees in Paper and Bioprocess Engineering should have strong undergraduate preparation in some of the following areas, depending on the particular area of study chosen: mathematics, chemistry, physics, engineering, biological sciences, and computer science.
Students in this program master a variety of subjects that are normally found in a chemical engineering program, and supplement those studies with advanced courses specific to Bioprocess Engineering. The program focuses on the use of wood and other renewable biomass materials to replace petroleum in energy and industrial product applications.
The department enjoys excellent external support in the form of graduate assistantships, fellowships, research assistantships, and support from industry as well as a number of government granting agencies.

1.3 Dual Degree Programs

Currently we have dual degree programs in Bioprocess Engineering with South China University of Technology, Guangzhou Institute of Energy Conversion CAS, Beijing University of Chemical Technology and Sichuan University. The dual degree programs have identical minimum requirements as the MS and PhD programs listed in this handbook.

2. Curricula of Degree Programs

2.1 Master of Professional Studies (M.P.S.)

The academic programs in the Department of Paper and Bioprocess Engineering (PBE) emphasize fundamental engineering science and engineering skills pertaining to chemical and materials engineering with specialization in wood products, the pulp, paper and allied industries, and the bioprocess and chemical industries.

Programs include courses in traditional areas of chemical and materials engineering, applied chemistry, industrial bioprocessing, industrial biotechnology, chemical engineering, and pulp and paper technology. The department's educational programs at both the undergraduate and graduate levels are committed to preparing students for leadership roles in the paper and bioproduct industries.

The program options leading the M.P.S. degree are designed for train students from other fields in the fundamentals related to paper engineering and bioprocess engineering. They are also ideal for engineers and scientists currently working in the industry who wish to retrain and refresh in a new field. The current demand for engineers at the B.S. level indicates that graduates of the M.P.S. program will be in high demand in the near future.

With only four universities across the United States with Paper Science and Engineering programs and only two with Bioprocess Engineering programs, the M.P.S. degree in the PBE department adds great value to your B.S. degree while opening up opportunities in a field where there is a shortage of engineers and scientists.

The M.P.S. degree requires the successful completion of a minimum of 30 to 36 credits at the graduate level (depending on the option chosen). A professional experience (internship) or synthesis completes is a key requirement of the M.P.S. degree requirements. The programs can typically be completed in 3 semesters on a full-time basis, but also can be done on a part-time basis. Some financial support is available from the Syracuse Pulp and Paper Foundation.

The M.P.S. program in the Department of Paper and Bioprocess Engineering has three options:

2.1.1 Bioprocess Engineering

This option is an area of study in Paper and Bioprocess Engineering program (PBE). This option encompasses both the use of renewable and sustainable resources (e.g., wood) for the production of chemicals, advanced materials, fuel, and energy, as well as the use of bioprocessing technology to produce such products. Such bioproducts extend to the production of energy from renewable resources including the use of gasification, co-firing of byproducts, anaerobic digestion, solar, and the production of ethanol. Courses include chemical engineering, advanced chemistry, biotechnology, and bioengineering, building on a strong base of mathematics, chemistry, and biology.

Table 2. MPS – BPE Minimum requirements

Number of credits	**30**
Core credits	12
Elective credits	12 - 15
Professional experience	3-6

The purpose of the MPS program is to provide students with a graduate degree in the practice and profession of bioprocess engineering. Students can expect to be trained broadly in the skills, science and engineering of biological processes and systems, chemicals, and allied products. The program emphasizes breadth in training and skills essential to an engineering professional by requiring coursework in technology, engineering, and application areas. This is in contrast to the Master of Science degree which is a more intensive course of study into the fundamental principles of the field including research-focused endeavors.

Table 3. Sample Curriculum for MPS - BPE

Courses		Core Course	Credit Hours
Fall	**Semester 1**		
PSE 570	Principles of Mass and Energy Balances	✓	3
BPE 620	Bioseparations	✓	3
	Elective (PSE 571 Fluid Mechanics recommended)		3
BPE 300	Introduction to Bioprocessing (recommended audit)		--
Spring	**Semester 2**		
BPE 535	Transport Phenomena	✓	3
	Elective		3
	Elective		3
Summer			
BPE 898	Professional Synthesis		3
Fall	**Semester 3**		
BPE 621	Bioreaction Engineering	✓	3
	Elective		3
	Elective		3

2.1.2 Paper Science and Engineering

This option is an area of study in Paper and Bioprocess Engineering program (PBE). Studies in this option deal closely with processes involved in the manufacture of pulp and paper as well as the allied industries. Courses concerned with this subject are central to a student's program, extended and enriched with selected courses in chemistry, polymers, chemical engineering, process control, applied mathematics, and computer applications. Supporting this work is an experimental pulp and paper mill with two complete paper machines, a pressurized refiner, and extensive auxiliary equipment.

Table 4. MPS - PSE Minimum requirements

Number of credits	**30**
Core credits	15
Elective credits	9-12
Professional experience	3-6

The purpose of the MPS program is to provide students with a graduate degree in the practice and profession of paper science and engineering. Students can expect to be trained broadly in the skills, science and engineering of the manufacture processes and systems of pulp, paper, chemical and allied products. The program emphasizes breadth in training and skills essential to an engineering professional by requiring coursework in technology, engineering and application areas. This is in contrast to the Master of Science degree which is a more intensive course of study into the fundamental principles of the technology and/or the applied science of paper.

Table 5. Sample Curriculum for MPS – PSE.

Courses		Core Course	Credit Hours
Fall	**Semester 1**		
PSE 570	Principles of Mass and Energy Balances	✓	3
PSE 665	Fiber and Paper Properties	✓	3
	Elective		3
PSE 200	Introduction to Papermaking (recommended audit)		--
Spring	**Semester 2**		
PSE 668	Papermaking Processes	✓	6
PSE 550	Fiber Processing	✓	3
Summer			
PSE 898	Professional Synthesis		3
Fall	**Semester 3**		
	Elective		3
	Elective		3
	Elective		3

2.1.3 Sustainable Engineering Management

This option is an area of study in Paper and Bioprocess Engineering program (PBE). This option is intended for students who are interested in the nationally recognized Professional Science Master program. It allows students to concentrate on either Bioprocess Engineering or Paper Science and Engineering topic areas together with (Plus) courses in business, management, policy, law, and other fields to form a Professional Science Master's program (PSM) recognized by the National PSM office (www.sciencemasters.com).

The PSM concept is an innovative graduate degree designed to allow students to pursue advanced training in science or engineering while also developing skills in the areas of business, management, and other professional skills. The educational objectives of the MPS in Sustainable Engineering Management are to produce graduates who effectively practice engineering for the design and operation of systems and can also apply their knowledge of business, management, policy, and other areas to their particular area of Sustainable Engineering Management. Graduates will have an understanding of their technical field together with a background in business and management.

2.1.3.1 Bioprocess Engineering or PSM – BPE

One option within the MPS Sustainable Engineering Management option is the Bioprocess Engineering. Effectively, this option is a PSM program in Bioprocess Engineering or PSM-BPE.

Table 6. PSM - BPE Minimum Requirements

Number of credits	**36**
Core credits	12
Plus Courses	12
Elective credits	6-9
Professional experience	3-6

The purpose of the PSM-BPE program is to provide students with a graduate degree in the practice and profession of bioprocess engineering. Students can expect to be trained broadly in the skills, science and engineering of biological processes and systems, chemicals, and allied products. In addition to their technical knowledge, graduates will have a background in business and management to understand the context of the industry in society. The PSM option will serve primarily the indicated industries by providing engineers and scientists that have additional business training.

Table 7. Sample Curriculum for PSM – BPE.

Courses		**Core Course**	**Credit Hours**
Fall	**Semester 1**		
PSE 570	Principles of Mass and Energy Balances	✓	3
BPE 620	Bioseparations	✓	3
	Elective (PSE 571 Fluid Mechanics recommended)		3
	Plus Course		3
BPE 300	Introduction to Bioprocessing (recommended audit)		--
Spring	**Semester 2**		
BPE 535	Transport Phenomena	✓	3
	Plus Course		3
	Plus Course		3
	Elective		3
Summer			
PSE 898	Professional Synthesis		3
Fall	**Semester 3**		
BPE 621	Bioreaction Engineering	✓	3
	Plus Course		3
	Elective		3

2.1.3.2 Paper Science and Engineering or PSM – PSE

One option within the MPS Sustainable Engineering Management option is the Paper Science and Engineering. Effectively, this option is a PSM program in Paper Science and Engineering or PSM-PSE.

Table 8. PSM - PSE Minimum Requirements

Number of credits	**36**
Core credits	15
Plus courses	12
Elective credits	3-6
Professional experience	3-6

The purpose of the PSM-PSE program is to provide students with a graduate degree in the practice and profession of paper science and engineering. Students can expect to be trained broadly in the skills, science and engineering of the manufacture processes and systems of pulp, paper, chemical and allied products. In addition to their technical knowledge, graduates will have a background in business and management to understand the context of the industry in society. The PSM option will serve primarily the indicated industries by providing engineers and scientists that have additional business training.

Table 9. Sample Curriculum for PSM – PSE.

Courses		**Core Course**	**Credit Hours**
Fall	**Semester 1**		
PSE 570	Principles of Mass and Energy Balances	✓	3
PSE 665	Fiber and Paper Properties	✓	3
	Plus Course		3
PSE 200	Introduction to Papermaking (recommended audit)		--
Spring	**Semester 2**		
PSE 668	Papermaking Processes	✓	6
PSE 550	Fiber Processing	✓	3
	Plus Course		3
Summer			
PSE 898	Professional Synthesis		3
Fall	**Semester 3**		
	Elective		3
	Elective		3
	Plus Course		3
	Plus Course		3

2.1.4 Wood Science, an option in CM&WPE

The department administers an M.P.S. degree in Construction Management and Wood Products Engineering with the option in Wood Science, which is open to students with a demonstrated interest in wood science or the wood products industry. A bachelor's degree in science or engineering is strongly recommended. Applicants to the M.P.S. in wood science and technology should have completed at least one semester of coursework in chemistry, biology, physics, and calculus.

2.1.5 Elective Courses for MPS programs

2.1.5.1 Paper Science and Engineering

PSE 550 Fiber Processing (3)
PSE 552 Fiber Materials Recycling and Processing (3)
PSE 561 Engineering Thermodynamics (3)
PSE 571 Fluid Mechanics (3)
PSE 596 Special Topics (1 - 3)
PSE 637 Equipment Troubleshooting and Maintenance (3)
PSE 638 Biorenewable Fibrous and Nonfibrous Products (3)
PSE 650 Pulping and Bleaching Processes (3)
PSE 656 Management in the Paper Industry (3)
PSE 665 Fiber and Paper Properties (3)
PSE 666 Paper Pigment and Barrier Coating (3)
PSE 667 Colloidal and Interface Science Applications in Papermaking (3)
PSE 668 Papermaking Processes (6)
PSE 669 Functional and Nano Additives (3)
PSE 677 Process Control (3)

2.1.5.2 Bioprocess Engineering

BPE 510 Introduction to Polymer Coatings (3)
BPE 511 Radiation Curing Equipment, Instrumentation and Safety (3)
BPE 535 Transport Phenomena (3)
BPE 536 Radiation Curing of Polymer Technologies (3)
BPE 596 Special Topics (1 - 3)
BPE 620 Bioseparations (3)
BPE 621 Bioreaction Engineering (3)
BPE 635 Unit Process Operations (3)
BPE 638 Introduction to Biorefinery Processes (3)
BPE 640 Bioprocess Kinetics Experiments and Data Analysis (3)
BPE 641 Biomass Energy (3)
BPE 681 Bioprocess Plant Design (3)

2.1.5.3 Other Engineering

GNE 661 Air Pollution Engineering (3)
ERE 530 Numerical and Computing Methods (3)
ERE 605 Sustainable Engineering (3)
ERE 640 Water Pollution Engineering (3)

CEN 5XX
CEN 6XX
CEN 7XX

2.1.5.4 Chemistry

FCH 510 Environmental Chemistry I (3)
FCH 524 Topics in Natural Products Chemistry (3)
FCH 530 Biochemistry I (3)
FCH 531 Biochemistry Laboratory (3)
FCH 532 Biochemistry II (3)
FCH 550 Polymer Science: Synthesis and Mechanisms (3)
FCH 551 Polymer Techniques (3)
FCH 552 Polymer Science: Properties and Technology (3)
FCH 560 Chromatography and Related Separation Sciences (3)
FCH 571 Wood Chemistry I: General Wood Chemistry (2)
FCH 620 Chemical Kinetics (3)

2.1.5.5 Environmental Science

ESC 525 Energy Systems (3)
ESC 622 Energy Markets and Regulation (3)

Other elective courses may be taken with the approval of the major professor.

2.1.6 The Plus Courses

2.1.6.1 SUNY ESF

APM 510 Statistical Analysis
APM 595 Statistics for Engineers
APM 620 Experimental Design and ANOVA
APM 625 Sampling Techniques
APM 630 Regression Analysis
APM 635 Multivariate Statistical Methods
APM 645 Nonparametric Statistics and Categorical Data Analysis
CME 543 Construction Estimating
CME 653 Construction Planning & Scheduling
CME 654 Construction Project Management
EST 605 Qualitative Methods
EST 608 Environmental Advocacy Campaigns and Conflict Resolution
EST 612 Environmental Policy and Governance
EST 635 Public Participation & Decision Making: Theory and Application
EST 640 Environmental Thought & Ethics
EST 645 Mass Media & Environmental Affairs
EST609 Collaborative Governance Processes
EST650 Environ Perception & Human Behavior
FOR 519 Green Entrepreneurship
FOR 533 Natural Resource Managerial Economics
FOR 560 Principles of Management for Environmental Professionals

FOR 610 Environmental Resources Business
FOR 665 Natural Resources Policy
FOR 685 Business and Managerial Law
FOR 687 Environmental Law & Policy
FOR 689 Natural Resource Law & Policy
FOR 690 Integrated Resources Management
FOR 694 Writing for Scientific Publication
FOR 753Advanced Natural Resource Policy
FOR 770 Ecological Economics and Policy
PSE 656 Management in the Paper Industry
PSE 680 Engineering Design Economics

2.1.6.2 SUNY-ESF/Syracuse University CASSE Courses

BUA/ECS 650/EST 696 Managing Sustainability: Purpose, Principles, and Practice
BUA/ECS 651 Strategic Management and the Natural Environment
BUA/ECS 759/EST 796 Sustainability-Driven Enterprise

2.1.6.3 Syracuse University

MBC 601 Economic Foundations of Business
MBC 602 Economics for International Business
MBC 603 Creating Customer Value
MBC 604 Managing the Marketing Mix
MBC 606 Information Technology for Decision Support
MBC 607 Understanding Financial Statements
MBC 608 Creating Financial Statements
MBC 609 Accounting for Managerial Decisions
MBC 616 Operations Management
MBC 617 Supply Chain Management
MBC 618 Competitive Strategy
MBC 619 Corporate Strategy
MBC 627 Financial Markets and Institutions
MBC 628 Fundamentals of Financial Management
MBC 629 Legal and Ethical Aspects of Management
MBC 630 Behavior in Organizations
MBC 631 Financial Accounting
MBC 632 Managerial Accounting
MBC 633 Managerial Finance
MBC 635 Operations and Supply Chain Management
MBC 636 Marketing Management
MBC 638 Data Analysis and Decision Making
MBC 639 Leadership in Organizations
MBC 642 Strategic Human Resource Management
MBC 643 The Legal, Natural, and Ethical
MBC 645 Strategic Management

2.1.6.4 SUNY Learning Network

EDF 715 Management Practice and Techniques	Buffalo State
EDF 688 Leadership in Organizations	Buffalo State
MLS 536 Problem Solving Procedures	Plattsburgh
MBA 502 Principles of Economics	Oswego
MBA 516 International Business	Oswego

2.1.6.5 Oswego State University MBA Program

MBA 501 Accounting
MBA 502 Principles of Economics (online-SLN)
MBA 503 Principles of Management
MBA 504 Quantitative Analysis
MBA 505 Operations Management
MBA 506 Legal Environment of Business
MBA 507 Financial Management
MBA 513 Managerial Finance
MBA 514 Marketing Management
MBA 516 International Business (online-SLN)
MBA 530 Employment Law
MBA 531 Management Economics
MBA 539 Managerial Accounting
MBA 540 Materials Management
MBA 568 Project Management
MBA 572 Taxation of Corporations, Partnerships, Estates, and Trusts
MBA 580 Entrepreneurship

2.2 Master of Science (MS) and Doctor of Philosophy (PhD)

Four options are available:

- Biomaterials Engineering (BME)
- Bioprocess Engineering (BPE)
- Paper Science and Engineering (PSE)
- Wood Science (WS)

2.2.1 Biomaterials Engineering (BME)

The BME option in the Paper and Bioprocess Engineering program offers areas of study in:

- Biocomposite Materials, Biopolymers
- Bioactive Materials and Biosensors
- Nanocomposites and Nanostructured Materials

2.2.1.1 Biocomposite Materials, Biopolymers

- Paper, cellulosic and natural fibrous materials
- Natural rolled erosion control products
- Bacterial cellulose and polyesters
- Wood, lignocellulosics-based composites, fiber-based composites

Various composites incorporating materials derived from bioresources such as lignocellulosics are critical to the future of sustainable development. This research area is focused toward training students on the design and performance of various composites engineered from sustainable and renewable materials. Biopolymers such as polylactic acid (PLA) and polyhydroxyalkanoates (PHA) are of particular interest for production from plant- or tree-based resources. These polymers, besides being produced from sustainable resources, degrade quickly in the environment and reduce the environmental footprint of the products. Therefore they contribute to sustainable living besides incorporating green processing principles. They also avoid the use of fossil carbon sources helping mitigate climate change effects in the environment.

2.2.1.2 Bioactive Materials and Biosensors

- Bioactive paper, cellulosic and natural fibrous materials
- E-paper
- Photosensitive polymers, fibers and materials
- Antimicrobial coatings, fibrous and nonwoven products

Novel and designed materials displaying significant biological activity, e.g. antibody binding, antimicrobials, photosensitive or other kinds of stimuli responsives are being applied for a wide array of sensors and uniquely functional products. Wound and hygiene care, protective materials, identification materials are of interest.

2.2.1.3 Nanocomposites and nanostructured materials

- Nanocrystallites of cellulose from wood
- Nanostructured fibrous materials from lignocellulosics
- Functionalized nanomaterials from lignocellulosic raw materials

A new area of research is nanocomposites and nanostructured materials. Many components of plants and trees are nanostructured. For example, cellulose microfibrils liberated from wood and plant cell walls can be incorporated into different polymers to yield composites of unique properties. These materials are usually derived from natural and renewable resources and contribute to sustainability.

2.2.2 Bioprocess Engineering (BPE)

Projects conducted in the department under this option develop fundamental knowledge of biorefinery processes for application in the production of a wide spectrum of industrial products and fuels from bioresources, primarily lignocellulosics.

Research is also supported by various U.S. federal and N.Y. state governmental agencies, sometimes in conjunction with private industrial partners.

The BPE option in the Paper and Bioprocess Engineering program offers areas of study in:

- Biocatalysis and Bioreaction Engineering
- Bioseparations Engineering
- Bioprocess Design, Simulation and Control
- Bioenvironmental Engineering
- Renewable Energy and Biofuels
- Biopharmaceuticals
- Industrial Biological Processes

2.2.2.1 Biocatalysis and Bioreaction Engineering

- Reaction mechanisms and kinetics
- Catalytic and activation effects

- Enzyme Chemistry, Engineering
- Fermentation Engineering
- Engineering of Bioreactors

Biocatalysis is the study of biological and chemical processes involving biocatalysts, enzymes and proteins. This area of study prepares students for traditional "upstream" operations: principles of design and operation of bioreactors and fermenters. Chemical and biological processes often involve reactions at the interfaces of liquid and solid, and are frequently diffusion limited. Understanding of surface activities as well as effective modeling of the process kinetics enables the engineer to design processes with optimal yield, rate of reaction using appropriately sized equipment. These form the core of most bioprocesses in the industry. Pilot plant facilities in these areas are also available.

2.2.2.2 Bioseparations Engineering

- Membrane-based separations: micro, ultra and nanofiltration; functionalized membranes
- Adsorptive, extractive and reactive separations
- Solid liquid separations: filtration, centrifugation
- Chromatographic separations
- Novel separation technologies: simulated moving bed and expanded bed adsorption and chromatography

Bioseparations is the study of separation of valuable products from the output of bioreactors using the wide spectrum of unit operations. Traditional "downstream" operations include membrane and chromatography processes. This area encompasses study of unit operations, separations, transport phenomena, thermodynamics, colloid and surface science and process engineering. There is extensive research effort and focus in this area. Current projects include membrane separations, adsorption, filtration, centrifugation, and novel separations based on functional materials. Pilot plant facilities in these areas are also available.

2.2.2.3 Bioprocess Design, Simulation and Control

- Process design
- Process simulation, dynamics, control
- Batch process scheduling

This area of study involves the design, simulation and control of batch and continuous processes. Coursework is concentrated in process simulation, process analysis and dynamics and control. This is supplemented by studies in downstream and upstream processing. The dynamic operation and scheduling of batch plants is an important aspect of bioprocesses. Process economics are an important adjunct to the modeling of manufacturing processes. Pilot plant facilities in these areas are also available.

2.2.2.4 Bioenvironmental Engineering

- Anaerobic and aerobic bioreactors
- Sludge and wastewater treatments
- Bacterial and enzymatic processes in environmental remediation

Bioenvironmental engineering links research with environmental and bioresource stewardship. Research here includes process dynamics and control, characterization and treatment of waste streams from bioprocesses, byproduct recovery, and computer simulation of environmental processing systems. The extensive laboratories and pilot plant in Walters Hall are strongly supported by computing facilities and expertise on campus. Pilot plant facilities in these areas are also available.

2.2.2.5 Renewable Energy & Biofuels

- Energy from biomass and other renewable sources
- Bioseparations of lignocellulosic materials into useful components
- Bioprocessing of renewable materials
- Creation of new bioproducts using ecologically sustainable processes

This area of study encompasses both the use of renewable and sustainable resources (e.g., wood) for the production of chemicals, advanced materials, fuel, and energy, as well as the use of bioprocessing technology to produce such products. Such bioproducts extend to the production of energy from renewable resources including the use of gasification, co-firing of byproducts, anerobic digestion, solar, and the production of ethanol. Courses include chemical engineering, advanced chemistry, biotechnology, and bioengineering, building on a strong base of mathematics, chemistry, and biology. Current research projects in this area include the bioseparation of xylan from hardwoods, the production of ethanol and acetic acid from wood hemicelluloses, development of separation processes for various bioproducts, gasification, enzymatic processing of lignocellulosic materials, and chemical production from sustainable resources as a replacement for non-renewable fossil fuels. Pilot plant facilities in these areas are also available. Many research projects in this area have extensive connections to industrial organizations.

2.2.2.6 Biopharmaceuticals

- Upstream processing, bioreactors
- Downstream processing

Biopharmaceuticals are typically biologically active proteins produced by using recombinant bacterial and mammalian cells. Bioprocesses to produce biopharmaceuticals typically utilize microbial and mammalian cell culture fermentation processes, tangential flow filtration, centrifugation and a variety of chromatographic separations. Principles of microbiology, fermentation technology, reaction kinetics, separation science, as well as statistical process control are used to develop highly reproducible processes that can produce consistent products necessary to meet GMP (good manufacturing practice) production requirements.

2.2.2.7 Industrial Biological Processes

- Biological processes in food and beverage manufacturing
- Industrial fermentation processes

Biological processes have been used for centuries to produce wine, beer and fermented foods. As processes and manufacturing efficiencies have improved, products such as antibiotics, vitamins, enzymes, specialty chemicals and even commodity chemicals have and are being produced using bioprocesses. Bioprocesses for these applications typically employ microbial fermentation processes, filtration or centrifugation, precipitation and/or crystallization and drying. Principles of microbiology, fermentation technology, reaction kinetics, separation science and process economics are typically required to develop large cost efficient manufacturing processes.

2.2.3 Paper Science and Engineering (PSE)

The PSE option in the Paper and Bioprocess Engineering program offers areas of study in:

- Pulping and Bleaching Processes
- Colloidal Chemistry and Fiber Flocculation
- Fiber and Paper Physics
- Process and Environmental Systems Engineering

2.2.3.1 Pulping and Bleaching Processes

- Reaction mechanisms and kinetics
- Applications of biotechnology
- Lignin and carbohydrate chemistry
- Chemicals from wood and pulping residues
- Energy from wood and pulping residues
- Chemical modification in mechanical pulping
- Catalytic and activation effects

This area of study focuses on chemical relationships and reactions basic to the manufacture and bleaching of pulp, as well as some papermaking operations. Courses in theoretical and applied chemistry are indicated, as well as specialized courses addressed directly to pulping and bleaching. Research centers on these same topics, currently stressing new and improved processes to increase energy efficiency and reduce environmental impact. These include studies on the pre-extraction of wood chips to produce acetic acid from acetyl groups, production of hydrogen and carbon monoxide from gasification of wood and pulping effluents, delignification and brightening with oxygen, hydrogen peroxide and ozone, enzyme treatment of effluent streams, mechanisms of carbohydrate reactions, and photosensitization of bleached pulps.

2.2.3.2 Colloidal Chemistry and Fiber Flocculation

- Paper sheet formation mechanisms
- Wet-end chemistry and physics
- Effects of additives in fiber networks

This study area deals with colloidal phenomena in the papermaking process, in particular the interaction among fibers, fine particles, polymeric additives, and electrolytes in stock preparation and sheet formation. Research topics fall into two categories: fundamental colloidal behavior of particles and behavior of paper stock on the paper machine. In the latter, extensive use is made of pilot plant facilities in Walters Hall. Current research projects include non-sulfur pulping, biopulping, chemicals and energy as byproducts, effects of wet pressing and press drying on sheet properties, pulping of tropical woods, and computer simulation and control of papermaking. Supporting this work is an experimental pulp and paper mill with two complete paper machines, a pressurized refiner and extensive auxiliary equipment.

2.2.3.3 Fiber and Paper Physics

- Fiber orientation and sheet properties
- Adsorption and transport of moisture in paper materials
- Mechano-sorptive phenomena

Mechanical behavior of fibers, paper and board, and other fiber networks and composites depends upon variables of material, process and structure at all levels, especially structural anisotropy. Recommended courses focus on mechanical and chemical engineering, mechanics of materials, physics, mathematics and statistics, microscopy, and wood and fiber properties. Research topics are basic in nature, designed to describe and model quantitatively the properties and behavior of fibers and fibrous structures. Current projects include studies of transient moisture sorption by paper materials, the effect of moisture on mechanical properties, influence of sheet structure on properties, use of image processing to characterize deformational behavior of paper, and determination of elastic constants of paper.

2.2.3.4 Process and Environmental Systems Engineering

- Energy from biomass and other renewable sources
- Bioseparations of lignocellulosic materials into useful components

- Bioprocessing of renewable materials
- Creation of new bioproducts using ecologically sustainable processes

Process engineering links research with development, design, operation, and optimization of manufacturing methods and equipment, seeking improvement through technological innovation consistent with environmental and resource stewardship. Principles of engineering science and mathematics are applied to analysis and dynamic modeling of units and systems, with increasing use of computers in both research and professional practice. Research here includes process dynamics and control, studies of new pulping and bleaching processes, characterization and treatment of waste streams, byproduct recovery, and computer simulation of paper-processing systems. The extensive laboratories and pilot plant in Walters Hall are strongly supported by computing facilities and expertise on campus. Appropriate advanced courses in engineering, mathematics and computer science are available to suit individual student interests and needs.

2.2.4 Wood Science (WS), an option in CM&WPE

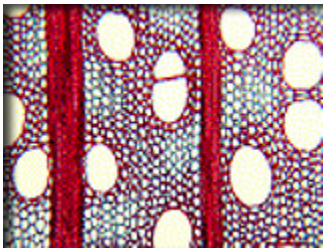
The department administers the Wood Science option of the Construction Management and Wood Products Engineering program. Applicants for the M.S. or Ph.D. degrees in the wood science option are required to have a bachelor's degree in science or engineering. Applicants must have the appropriate undergraduate degree for the option they pursue. Applicants must have completed at least one semester of coursework in chemistry, biology, physics and calculus.

2.2.4.1 Engineered Wood Products and Structures (timber structure design)

- Dr. George Kyanka
- Dr. Rafaat Morsi-Hussein

Students with interest in Engineered Wood Products and Structures should have a strong background in integral calculus, statics, mechanics, and mechanical and physical properties of wood. The behavior of wood and wood-based components under loads and the effects of duration of the loads are critical elements when developing engineering codes. Wooden components as small as dowels or as large as bridge beams are considered, using elements of materials science, engineering mechanics and structural engineering. Basic property knowledge, employing theories of elasticity, visco-elasticity and fracture mechanics, is coupled with computer-aided design data to analyze the performance of wood and to solve application problems, such as those encountered in wood-frame construction and timber utility structures. How such factors as chemical fire retardant treatments, adhesive performance and mechanical fastener design interact with use requirements is considered. National and international design codes and their development play an important role in specifying research areas of current interest and need. Fabrication and testing of actual components such as trusses, composite beams, and furniture connections are completed in the department's Wood Engineering Laboratory.

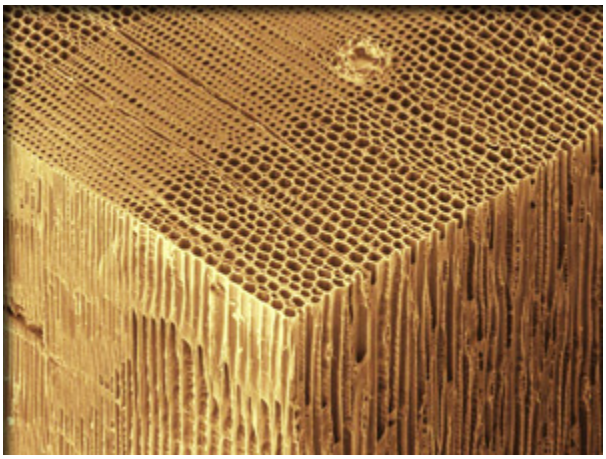
Topics of study may include: Materials science, Engineering mechanics and elasticity, Engineering properties of wood composites, Computer-aided design, Static and dynamic properties of wood.



2.2.4.2 Tropical Timbers

- Dr. Susan E. Anagnost
- Dr. Robert Meyer

Studies of tropical timbers take many forms, depending on individual student interests. Often students from other countries bring specific problems and materials with them so their thesis will find immediate application when they return home. The holdings of the C. deZeeuw Memorial Library and reference wood specimens of the H.P. Brown Memorial Wood Collection of the Tropical Timber Information Center (TTIC), housed in Baker Laboratory facilities, are vital to this work. Research topics may be formulated to answer questions dealing with anatomy, identification, properties or uses of various woods from around the world, using the TTIC reference materials. These studies may be quite narrow, such as anatomy and physical properties of woods from a particular region, or much broader, such as regional distribution of species and species groups based on life zone research throughout a country or larger geographic area.
Topics of study include: Wood Identification keys and systematics, Wood properties and end use suitability, Life zone analyses, Expert systems.



2.2.4.3 Wood Anatomy and Ultrastructure

- Dr. Susan E. Anagnost
- Dr. Robert Meyer

Students with interest in Wood Anatomy and Ultrastructure should have an undergraduate degree in wood anatomy or the biological sciences. Students are required to develop an extensive background in all aspects of microscopy: light, scanning electron, transmission electron, video microscopy and image analysis, including micro-techniques for effective preparation of specimens for the appropriate instrument. Wood anatomy studies are basic to wood identification, wood utilization, and physical/mechanical properties. These studies may include woods from other continents.
The field of ultrastructure is very broad with applications in many biological, chemical and materials sciences. Applied to wood, it emphasizes the sub-light microscopic structures (smaller than 0.2 micrometers) found in this natural material, either in the mature form or in its formative stages where various organelles of the living cell may be studied for their roles in producing the mature wood cell.
The behavior of wood in its many applications can be observed and explained via microscopy and related instrumentation such as EDXA (energy-dispersive x-ray analysis). State-of-the-art resources and facilities are concentrated in the Center for Ultrastructure Studies, which provides instruction and research support staff.
Students entering this program should have an undergraduate degree in wood anatomy or the biological sciences.

Topics of study include: Wood formation and cell wall organization, Cytoskeleton of plant cells, Properties related to anatomy and ultrastructure, Electron and light microscopy.

2.2.4.4 Wood Science and Technology

- Dr. Susan E. Anagnost
- Dr. George Kyanka
- Dr. Robert Meyer
- Dr. Rafaat Morsi-Hussein
- Dr. William B. Smith

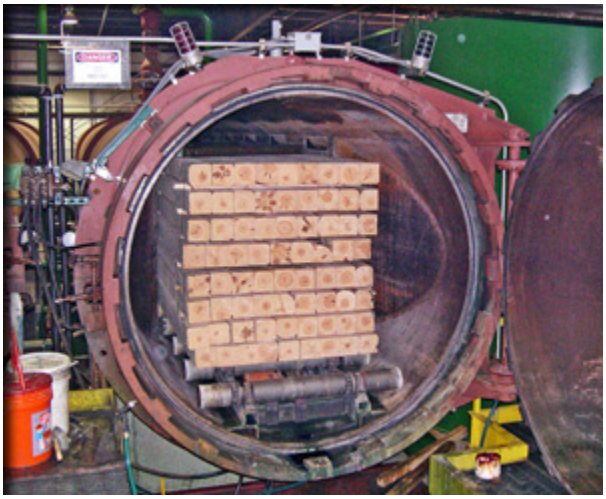
Because wood is renewable, it will meet the needs of modern society for a perpetually available, carbon-neutral material perfectly suited for a vast array of products. The study area Wood Science and Technology includes detailed research on physical, mechanical, or anatomical aspects of wood and its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

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

Topics of study include: Processing and machining, Mechanical and physical properties, The effects of wood anatomy on the physical and mechanical properties of wood, Wood biodegradation, Wood composites, Wood drying and physics, Adhesives and finishing, Dendrochronology.

2.2.4.5 Wood Treatments

- Dr. Susan E. Anagnost
- Dr. William B. Smith



Graduate study in the area of wood treatments allows the student to investigate the scientificbasis for the improvement of wood and wood products with various treatments, which include drying, preservative treatments and coatings. Preparation for research includes graduate coursework in wood-water relationships and transport processes and additional study in areas such as wood anatomy and ultrastructure, mechanical properties, wood chemistry, wood microbiology, thermodynamics, and engineering economics. Current research interests include use of innovative techniques to dry and preserve wood, effects of drying method on the subsequent treatability of wood, evaluation of energy usage in lumber drying technologies, improving wood properties with polymer treatments, and moisture migration studies.

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

Topics of study include: Wood-water relationships and wood drying, Preservative treatments, Polymer treatments, sealants and coatings.

2.3 Sample Curricula Selection Semester by Semester (MS, PhD)

All graduate students will be required to take 9 credits of coursework from the three groups listed in Table in pages 8. At least 3 credits must be taken from each of A, B and C. Students may obtain credit for equivalent courses taken elsewhere upon approval of the steering committee and appropriate petition procedures.

2.3.1 BPE Option

MS Program

SEMESTER 1

Course	Number	Credits
Bioreaction Engineering	BPE 621	3
Bioseparations	BPE 620	3
Introduction to Biorefinery Process	PSE 666	3
Thesis Research	BPE 899	3

SEMESTER 2

Colloidal and Interfacial Sci	PSE 667	3
Advanced Biocatalysis	BPE 658	3
Bioprocess Design	BPE 681	3
Thesis Research	BPE 899	3

SEMESTER 3

Prof and Tech Writing	EWP 605	3
Thesis Research	BPE 899	3
Capstone Seminar	BPE 797	1

PhD Program (continue on from MS Program, however BPE 899 should be replaced by BPE 999 in the above table)

SEMESTER 4

Course	Number	Credits
Introduction to Biorefinery Processes	BPE 638	3
Polymer properties	FCH 552	3
Advanced Catalysis and Surface Reactions	BPE 650	3
Thesis Research	BPE 999	3

SEMESTER 5

Chemical Engineering Thermodynamics	CEN 656	3
Thesis Research	BPE 999	9

SEMESTER 6

Thesis Research	BPE 999	12

SEMESTER 7

Thesis Research	BPE 999	6
Capstone Seminar	BPE 797	1

2.3.2 Suggested Courses in Bioprocess Engineering

BPE 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.

BPE 620 Bioseparations (3)

Three hours of lecture per week. Cell disruption, solid liquid separations, centrifugation, chromatographic techniques (gel filtration, affinity, ion exchange), and membrane processes. Extraction. Crystallization and drying. Aseptic filtration. Fall. Prerequisite: BPE 501. Note: Credit will not be granted for both BPE 620 and BPE 420.

BPE 621 Bioreaction Engineering (3)

Three hours of lecture/discussion per week. Bioprocess kinetics, reaction engineering, mass and energy balances, stoichiometry, enzyme kinetics, growth and product synthesis kinetics, mass transfer effects, bioreactor analysis and design, instrumentation and control, batch processing, bioreactor scale-up, agitation, oxygen delivery, heat removal and kinetics of sterilization (clean and sterilization in place (CIP and SIP). Spring. Prerequisites: Mass and Heat Transfer, or Transport Phenomena. Note: Credit will not be granted for both BPE 621 and BPE 421.

BPE 623 - Chemistry of Lignocellulosic Biomass (3)

Three hours of lecture and discussion per week; advanced science course with discussion and literature research through the topics in chemistry of lignocellulosic biomass, including wood, grasses, and agriculture residues; major (cellulose, hemicelluloses, lignin) and minor constituents (extractives) – biosynthesis, structure, properties, physico-chemical association, use in biorefineries. Spring
Prerequisite: Organic Chemistry I Lecture and Lab plus either Organic Chemistry II Lecture and Lab or PSE223 Lecture and Lab or equivalent or by instructor's permission

BPE 635 - Unit Process Operations (3)

Two hours of lecture and three hours of laboratory and/or recitation, discussions. Topics include packed towers, tray columns, fluidized bed, fluid mechanic limitations, pressure drop, mass transfer coefficient, mass transfer limits, thermodynamic limits, equilibrium stage calculations, packed tower and tray column design and performance analysis. Fall.

BPE 638 - Introduction to Biorefinery Processes (3)

Three hours of lecture and discussions per week. Topics covered include chemical and physical properties of biomass feedstocks; sustainable biomass production/utilization, chemical and biological processes of converting plant biomass to chemicals, liquid fuels, and materials. Focus on green chemistry and/or environmentally benign processes, with some discussions on political and social aspects of sustainability and renewability. Fall. *Note: Credit will not be granted for both BPE 438 and BPE 638*

BPE 640 - Bioprocess Kinetics Experiments and Data Analysis (3)

One hour of lecture and six hours of laboratory per week. Planing and execution of laboratory exercises. Measurement and analysis of adsorption, chemical and biological transformations,including batch and/or continuous systems. Adsorption and chemical transformation or catalytic reactions may include solid catalyst(s), acid catalyst(s), base catalysts(s) or other agents. Biological transformtaion may include enzyme, bacteria, fungi or yeast. Bioprocess kinetics and mass transfer effects. Coaching fellow students on experimental procedures and safety requirements. Parametric analysis. Report writing and seminar presentation. Spring.
Prerequisite(s): Consent of instructor Note: Credit will not be granted for both BPE 440 and BPE 640

BPE 650 Advanced Catalysis and Surface Reactions (3).

Three hours of lecture per week. Intended for graduate students in Bioprocess Engineering and Chemical Engineering. Topics covered in this course may include gas and/or liquid interactions with solid surfaces, adsorption, catalysis on solid surfaces, and kinetics in systems involving solid particles and/or macromolecules. Discussions will be on an advanced level especially for kinetics and reactor analysis. Spring.
Pre-requisites: BPE 421, or Consent by instructor

BPE 658 Advanced Biocatalysis (3).

Three hours of lecture per week. This course is intended for graduate studenst in Bioprocess Engineering. Topics covered in this course may include enzyme, microbial and/or mammalian cell catalyzed molecular transformations. Biotransformations occur, at the fundamental level, due to the particular enzymes. Interactions between enzyme and ligand / substrate hold the key on how the reaction is regulated. On the

cell level, enzymes work in tandem to convert one or more key substrate into one or more desired product. The mechanism and progress in the understanding of molecular transformations in microbial and mammalian systems are selectively covered. Discussions will be on an advanced level especially for kinetics and reactor analysis. Fall.
Pre-requiste: BPE 421 Bioprocess Kinetics and System Engineering, or consent by instructor.

BPE 681 Bioprocess Plant Design (3)
Three hours of lecture per week. Topics covered include integration of process and support systems and equipment; concepts of facility design integrating Good Manufacturing Practice (GMP), equipment and systems cleanability, people flow, product protection, capital investment, and operating costs. This course will focus towards facility design in the biopharmaceutical industry. Spring. Prerequisites: BPE 620, BPE 621 or equivalents.

BPE 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. Prerequisite: Permission of instructor.

BPE 797 Seminar (1 - 3)
Discussion of assigned topics in the fields related to Bioprocess Engineering. Spring and Fall.

BPE 798 Research in Bioprocess Engineering (1 - 12)
Independent research topics in Bioprocess Engineering. Fall, Spring or Summer. Credit hours to be arranged.

BPE 898 Professional Experience/Synthesis (1 - 6)
A supervised, documented professional work experience in the Master of Professional Studies degree program. Fall, Spring, or Summer. Pre- or co-requisite(s): Approval of proposed study plan by advisor, Faculty, and any sponsoring organization.

BPE 899 Master's Thesis Research (1 - 12)
Research and independent study for the master's thesis. Fall, Spring or Summer. Credit hours to be arranged.

BPE 999 Doctoral Thesis Research (1 - 12)
Research and independent study for the doctoral dissertation. Fall, Spring or Summer. Credit hours to be arranged.

APM 585 - Partial Differential Equations for Engineers and Scientists (3)
Three hours of lecture per week. Analytical solutions of parabolic, hyperbolic and elliptic partial differential equations which appear in science and engineering. Numerical and approximate methods of solution. Spring.
Prerequisites: APM 485; or equivalent course.

APM 620 - Experimental Design and ANOVA (3)
Three hours of lecture per week. Designing and analyzing experiments and observational studies; completely randomized, split plot, randomized complete block, and nested experiment designs; single-factor, factorial, and repeated measures treatment designs; expected mean squares and variance components; fixed, random, and mixed effects models; multiple comparison and contrast analyses; analysis of covariance; statistical computing. Spring.
Prerequisites: Graduate status and an introductory course in statistics covering material through the one-way analysis of variance.

ERE 568 - Solid and Hazardous Waste Engineering (3)
Three hours of lecture and discussion. Introduction to solid and hazardous waste regulations. Analysis and design of solid and hazardous waste management systems, including generation, storage, transport, recycling, biological, physical, chemical and thermal treatment; energy recovery; land disposal;

environmental protection systems and monitoring. Field trips. Fall.
Note: Credit will not be granted for both ERE 468 and ERE 568.

ERE 640 - Water and Wastewater Treatment (3)
Three hours of lecture per week. Two laboratory exercises and one field trip during three regular class meeting times, and an individual or group project. Design principles and practice of unit operations and processes for water and wastewater treatment. Study of the engineering concepts and design procedures for water and wastewater treatment. Spring.
Prerequisite(s): General chemistry, microbiology, water quality, and fluid mechanics or hydraulics Note: Credit will not be granted for both ERE 440 and ERE 640.

EWP 597 - Graduate Scholarly Writing (3)
Students learn advanced writing principles to produce a proposal, thesis, dissertation, or manuscript. Topics include the writing process, use of sources, and graphics. Scholarly writing style and mechanics are discussed with emphasis on organization, clarity, and conciseness. Spring.

FCH 510 - Environmental Chemistry I (3)
Three hours of lecture per week. Introduction to the processes that control chemical behavior in aquatic environments, including precipitation, dissolution, gas exchange, acid-base, oxidation-reduction, complexation and adsorption reactions. Emphasis will be on explanation and prediction of chemical behavior. Examples will be from the areas of fresh and marine waters, groundwater, wastewater, and geo-chemistry. Spring.
Prerequisites: An introductory course in physical chemistry is required.

FCH 511 - Atmospheric Chemistry (3)
Three hours of lecture/discussion per week. Graduate-level course in atmospheric chemistry. Atmospheric structure and composition. Catalytic cycles of ozone destruction and formation. Kinetic analysis of atmospheric reactions in gas and aqueous phase. Aerosols. Global climate change. Oxidation of sulfur oxides and nitrogen oxides. Fall.
Prerequisite: One year of undergraduate chemistry or permission of instructor.

FCH 530 - Biochemistry I (3)
Three hours of lecture per week. General biochemistry with emphasis on the chemistry of amino acids, proteins, and nucleic acids. The first half of the course will cover the chemistry of amino acids, proteins, and protein structure. The second half of the course will be an introduction to nucleic acid structure and function. This course requires critical review of current topics in Biochemistry not required in FCH 430. Fall
Prerequisite: FCH150, FCH151, FCH221, FCH223 or equivalents.

FCH 531 - Biochemistry Laboratory (3)
Two hours lecture and 6 hours of laboratory per week on the basic techniques used in biochemical research with an emphasis on proteins and enzymes. Techniques include spectrometry, chromatography, electrophoresis, amino acid analysis, coupled assays, and the isolation and characterization of enzymes. This course requires critical review of current topics in Biochemistry not required in FCH 431. Fall.
Prerequisites: FCH150, FCH152, FCH221, and FCH223 or equivalents. Co-requisite: FCH530 or persmission of instructor

FCH 532 - Biochemistry II (3)
Three hours of lecture per week. Topics discussed are: Biochemistry of metabolism, sugars, polysaccharides, glycolysis, pentose phosphate pathway, glycogen formation, gluconeogenesis, glyoxylate shunt, TCA cycle, electron transport and oxidative phosphorylation, fats, fatty acid metabolism, amino acid metabolism, purine and pyrimidine metabolism, and photosynthesis. This course requires critical review of current topics in Biochemistry not required in FCH 432. Spring
Prerequisites: FCH150, FCH151, FCH221, FCH223, and FCH530 or equivalents

FCH 550 - Polymer Science: Synthesis and Mechanisms (3)

Three hours of lecture per week. Introduction to the synthesis of polymers and the mechanism of polymerization processes. Fundamental principles of polymer chemistry. Step-growth polymerization and network formation (theory of gelation). Chain-growth homopolymerization and copolymerization by radical-, ionic-, and coordination type catalysts. Synthesis of block and graft copolymers. Structure of polymers and their application. Polymers and the environment, polymer recycling. Fall
Prerequisites: One year of organic chemistry and one year of physical chemistry.

FCH 551 - Polymer Techniques (3)

Two hours of lecture/discussion and four hours of laboratory per week; laboratory reports, final exam. Twelve experiments covering the main topics of polymer synthesis (four weeks), molecular weight determination (four weeks), and characterization (four weeks) are selected from areas such as the following: free-radical solution, bulk and emulsion polymerizations; ionic and condensation polymerizations, copolymerization and reactivity ratio determination; osmometry, viscometry, light scattering, gel permeation chromatography, polarized light microscopy, X-ray diffraction, differential scanning calorimetry, thermogravimetric analysis, dynamic mechanical analysis, stress-strain analysis; nuclear magnetic resonance spectroscopy, Fourier transform infrared spectroscopy, ultraviolet/visible spectroscopy. The lecture component will include discussions of the laboratory activities as well as related topics such as the preparation of monomers, safe handling methods for monomers, polymers, solvents, catalysts, etc. Fall.
Prerequisites: One year of organic and one year of physical chemistry, or permission of instructor. Co-registration in FCH 552 is recommended.

FCH 552 - Polymer Science: Properties and Technology (3)

Three hours of lecture per week. Introduction to physical chemistry, physics, processing and technology of synthetic polymers. Polymer solutions, including molecular weight determinations, chain statistics, and thermodynamics. Polymer solid states, including rubber elasticity, viscoelasticity, the glassy state and the crystalline state. Properties, processing, and technology of films, fibers, elastomers, and composites. Spring.
Prerequisites: One year of organic chemistry and one year of physical chemistry.

FCH 560 - Chromatography and Related Separation Sciences (3)

Three hours of lecture and discussion per week. A course designed to give the student a thorough understanding of analytical and isolation chemistry by modern chromatographic, distributive and molecular sieving techniques. The chemistry of the systems discussed will be stressed as well as the important physical aspects. Spring of even years.
Prerequisites: Two semesters each of organic and general chemistry

FCH 610 - Air Quality (3)

Three hours of lecture and discussion per week. Pollution emissions; atmospheric photochemistry; dynamic/physical mechanisms; dynamic/physical-chemistry interactions; measurement campaigns; major chemical and meteorological databases; numerical modeling tools (box models, meteorological models, photochemical models); model uncertainties and evaluation; model application. Spring.
Prerequisite: FCH 511 Atmospheric Chemistry or by instructor's permission

FCH 620 - Chemical Kinetics (3)

Three hours of lecture/discussion per week. Graduate course in chemical kinetics. Building rate laws and analyzing experimental data. Transition state and RRKM theories. Kinetics in the aqueous phase and on surfaces. Kinetic modeling of complex reaction systems. Analysis of published papers in chemical kinetics. Spring of alternating years.
Prerequisites: 1 year undergraduate physical chemistry

GNE 661 - Air Pollution Engineering (3)

Three hours of lecture and discussion per week. Study of physical, chemical, legislative, and meteorological aspects of air pollution and its control. Air quality and emission standards. Local and global effects of air pollution and atmospheric dispersion modeling. Design principles of air pollution

control devices. Fall.
Prerequisites: 1 year of college-level physics, chemistry and calculus. Note: Credit will not be granted for both GNE 461 and GNE 661.

2.3.3 PSE Option

MS Program

SEMESTER 1

Course	Number	Credits
Pulping Technology	PSE 550	3
Paper Properties	PSE 668	3
Paper Coating and Conv	PSE 666	3
Thesis Research	PSE 899	3

SEMESTER 2

Colloidal and Interfacial Sci	PSE 667	3
Papermaking Processes	PSE 665	3
Process Control	PSE 667	3
Thesis Research	PSE 899	3

SEMESTER 3

Prof and Tech Writing	EWP 605	3
Thesis Research	PSE 899	3
Capstone Seminar	PSE 797	1

PhD Program, continued from MS program above however with PSE 899 replaced with PSE 999.

SEMESTER 4

Course	Number	Credits
Management in Industry	PSE 656	3
Polymer properties	FCH 552	3
Materials and Proc in Mfg	MEE 636	3
Thesis Research	PSE 999	3

SEMESTER 5

Chemical Eng Thermodyn	CEN 656	3
Thesis Research	PSE 899	9

SEMESTER 6

Thesis Research	PSE 899	12

SEMESTER 7

Thesis Research	PSE 899	6
Capstone Seminar	PSE 797	1

To be awarded a graduate degree in Paper Science and Engineering, students are expected to be knowledgeable in the areas of pulping and bleaching (PSE 650), paper properties (PSE 665), and papermaking (PSE 668), as shown in Table 2 on page 5. These courses can either through having passed these as an undergraduate (UG) (eg. PSE 450, PSE 445 and PSE 468) at this College or by passing, with a grade of "B" or better, the corresponding graduate level courses (G). However, undergraduate level course credits cannot be applied toward graduate degree course requirements.

2.3.4 Suggested Courses in Paper Science and Engineering

BPE 623 - Chemistry of Lignocellulosic Biomass (3)

Three hours of lecture and discussion per week; advanced science course with discussion and literature research through the topics in chemistry of lignocellulosic biomass, including wood, grasses, and agriculture residues; major (cellulose, hemicelluloses, lignin) and minor constituents (extractives) – biosynthesis, structure, properties, physico-chemical association, use in biorefineries. Spring
Prerequisite: Organic Chemistry I Lecture and Lab plus either Organic Chemistry II Lecture and Lab or PSE223 Lecture and Lab or equivalent or by instructor's permission.

PSE 552 - Fiber Materials Recycling and Processing (3)

Two hours of lecture and three hours of laboratory and/or recitation discussions per week, plus literature study of assigned topics. Topics include advanced process operation and calculations for deinking, dispersion, washing, cleaning and bleaching of recycled fiber raw materials including related chemistry used in the paper processing industry. Spring and or Fall.

PSE 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.

PSE 637 Equipment Troubleshooting & Maintenance (3)

Two hours of lecture and three hours of laboratory and/or recitation discussions,plus literature study of assigned topics. Provides students with fundamental knowledge in troubleshooting and maintenance of industrial machines, processes and systems used in pulp and paper, bioprocess, and chemical engineering field. Spring and / or Fall.

PSE 638 Biorenewable fibrous and nonfibrous products (3)

Three credit-hour advanced science course on the production and properties of lignocellulosic products. Topics encompass fibrous products including different paper grades, nanocellulose and cellulose derivatives, and nonfibrous products including products of enzymatic and/or chemical conversion of biomass constituents. Spring.
Prerequisite(s): PSE 465 Fiber and Paper Properties and/or PSE 223 Introduction to Lignocellulosics or consent of instructor.

PSE 650 - Pulping and Bleaching Processes (3)

Two hours of lecture, three hours of laboratory per week plus a critical review of recent literature on assigned topics including a technical write-up and presentation. Discussion of principle and fundamental chemistry in pulping and bleaching processes. Conducted experiments in pulping, bleaching and pulp evaluation. Spring.
Prerequisite(s): Organic, physical and analytic chemistry. Note: Credit will not be granted for both PSE 450 and PSE 650.

PSE 656 Management in Industry (3)

Three hours of lecture per week. Discussion of published approaches to managerial excellence are supplemented with current reports from periodicals, newspapers, and business and human resource oriented websites to prompt discussion of underlying principles of good management. Examples of good and bad results from published examples are used to prompt discussion of current issues in management around the world. Current and retired business managers are invited to guest lecture and share their experience with the students. The correlation between excellent business results and excellence in management of people is included and discussed. Students will critically review selected literature and present their findings. Spring. Note: Credit will not be granted for both PSE 456 and PSE 656.

PSE 665 Paper Properties (3)

Two hours of lecture and three hours of laboratory per week. Advanced science course in evaluation, study, and discussion of the physical, optical, and chemical properties of fibers, non-fibrous paper additives, and paper. The interrelationships between fibers and nonfibrous paper additives, and

manufacturing methods, and their effects on the final paper quality of paper are discussed. Independent academic research required. Spring and/or Fall. Prerequisite: Permission of instructor. Note: Credit will not be granted for both PSE 465 and PSE 665.

PSE 666 Paper Pigment and Barrier Coating (3)

Two hours of lecture per week. Advanced course in materials and processes used in surface sizing, pigment coating, and barrier coating for graduate students. Study of equipment used in coating operations, fundamentals and parameters, which control their use and effects on final paper properties. Independent literature research with report and presentation on a selected topic. Spring and/or Fall. Prerequisite: Permission of instructor. Note: Credit will not be granted for both PSE 466 and PSE 666.

PSE 667 Colloidal and Interface Science Applications in Papermaking (3)

Three hours of lecture per week. Provides the student with the fundamental principles of Colloidal and Interface Science as it relates to the interaction of papermaking materials and chemical additives in the wet end of a paper machine system. The topics of retention of fine solids and dewatering are addressed in detail. Spring. Pre- or co-requisite: Physical chemistry.

PSE 668 Papermaking Processes (6)

One hour of lecture and fifteen hours of laboratory per week. Study of the papermaking process from theoretical and practical standpoints featuring the operation of the pilot paper machines. Emphasis is on the fundamentals of stock preparation and paper machine operations, papermaking process and product design, evaluation of the finished product, and the collection and analysis of process data. An independent project is required in conjunction with the undergraduate paper machine runs. Spring. Pre- or co-requisite(s): PSE 665. Note: Credit will not be granted for both PSE 468 and PSE 668.

PSE 669 Functional Additives (3)

Two hours of lecture and three hours of laboratory and/or recitation discussions, plus literature study of assigned topics. Provides the student with fundamental knowledge of functional additives used in fibrous materials, nanocomposites and such, with particular emphasis on materials from sustainable resources. Additives are used to enhance material performance with respect to strength, optical properties, moisture reactivity, electrical and thermal, biological and other functionalities. Spring and or Fall.
Note: Credit will not be granted for both PSE 469 and PSE 669.

PSE 677 Process Control (3)

Three hours of lecture per week. Presents an introduction to the principles of process control. Linear analysis, LaPlace transforms, and nonlinear simulation are presented and applied to feedback, and feedforward control. Examples of process simulation, accuracy and stability of control are drawn from paper industry processes. Process identification using numerical techniques and MATLAB. Fall. Prerequisite: Differential Equations. Note: Credit will not be granted for both PSE 477 and PSE 677.

PSE 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. Prerequisite: Permission of instructor.

PSE 797 Seminar (1 - 3)

Discussion of assigned topics in the fields related to Paper Science Engineering. Spring and Fall.

PSE 798 Research in Paper Science Engineering (1 - 12)

Independent research topics in Paper Science Engineering. Fall, Spring or Summer. Credit hours to be arranged.

PSE 898 Professional Experience/Synthesis (1 - 6)

A supervised, documented professional work experience in the Master of Professional Studies degree program. Fall, Spring, or Summer. Pre- or co-requisite(s): Approval of proposed study plan by advisor, Faculty, and any sponsoring organization.

PSE 899 Master's Thesis Research (1 - 12)

Research and independent study for the master's thesis. Fall, Spring or Summer. Credit hours to be arranged.

PSE 999 Doctoral Thesis Research (1 - 12)
Research and independent study for the doctoral dissertation. Fall, Spring or Summer. Credit hours to be arranged.

EWP 597 - Graduate Scholarly Writing (3)
Students learn advanced writing principles to produce a proposal, thesis, dissertation, or manuscript. Topics include the writing process, use of sources, and graphics. Scholarly writing style and mechanics are discussed with emphasis on organization, clarity, and conciseness. Spring.

MCR 580 - Microtechnique of Wood (3)
Three hours of laboratory per week. Instruction on the use of the sliding mcirotome to slice thin sections of wood for light microscopy and for sample surface preparation of wood for scanning electron microscopy. Care of the microtome blade, staining of wood sections and preparation of micrsocope slides. Fall or Spring
Prerequisite: Permission of instructor
Professor consent is required to register for this course.

MCR 680 - Fundamentals of Microscopy (3)
Three hours of lecture/demonstration per week. Introduction to light microscopy, electron microscopy,atomic force, confocal, Raman, Near Field Optical, Correlative and other microscopic methods and their newest applications. Light microscopic techniques include brightfield, phase contrast, polarized light, Nomarski, Kohler illumination. Imaging and recording methods. Fall.

MCR 783 - Operation of the Scanning Electron Microscope (3)
Two hours of lecture/three hours of demonstration/ laboratory per week. Theory and operation of the scanning electron microscope, including specimen preparation, digital imaging, and interpretation of micrographs. Fall.

3. Non-Degree Programs

Non-Degree programs are generally offered through the Outreach Office for non-matriculated students. The courses can be taken at leisure and can be arranged in any fashion. Apart-from the free-style approaches one can take, there are recognized Advanced certificate programs available. Students fulfilling all the course requirements can apply for a certificate.

3.1 Advanced Certificate in Bioprocessing

The Advanced Certificate in Bioprocessing is a graduate level program offered by the SUNY College of Environmental Science and Forestry (SUNY-ESF), in partnership with the Central New York Biotechnology Research Center (CNY BRC). Certification is approved by the State University of New York (SUNY) and the New York State Education Department. The program provides a focused, advanced, practical education in bioprocessing, and is designed with special consideration and support for professionals who work full-time. This Certificate was designed by ESF faculty and staff, along with other researchers and practitioners from academic and industry organizations such as Bristol-Myers Squibb.

Participants earn 15 graduate credits through five courses, as well as a post-baccalaureate Certificate of Advanced Study, all while retaining their jobs, staying on career trajectories, and enhancing their professional networks. Professionals spend 10 months strengthening their

bioprocessing knowledge and skills and engaging with faculty and other participants from a range of academic science and engineering backgrounds. The program offers high-quality instruction that causes minimal interruption to participants' lives and work.

Bioprocessing is a fundamental discipline in major growth industries around the world. This specialty figures most prominently in the pharmaceutical industry, where therapeutic biologics are developed and manufactured. Bioprocessing is also at the heart of bioprocess-based industries such as breweries, wineries, distilleries, and in current and future production plants of fuel ethanol and other bio-based products. These examples are evidence of bioprocessing's potential to dramatically enhance economic activity.

The Advanced Certificate in Bioprocessing program was developed through a collaborative and interdisciplinary effort between business and academia to take advantage of this region's unique expertise and resources. Graduates of the program will support the development and manufacture of products produced through bioprocesses, such as those produced in the pharmaceutical and fermentation industries, and biorefineries.

The purpose of the certificate program is to provide:

- Graduate education in bioprocessing that leads to a documented level of competency for practice;
- A structured and documented course of study at the graduate level; and
- A means for students to improve their competitive position in the employment marketplace.

Applicants must hold a bachelor's degree from an accredited institution in engineering, science or a related area. The student must have the required prerequisite background in topics that are fundamental to bioprocessing guided from previous coursework or professional experience. Applicants must demonstrate competence in pre-calculus and quantitative problem solving, preferably with calculus. Students who are matriculated in ESF graduate degree programs are not eligible to earn the Advanced Certificate in Bioprocessing.

Application and admissions procedures, compliance with college requirements for successful graduate-level study, and the awarding of advanced certificates are administered by the dean of Instruction and Graduate Studies. Applicants should complete and submit the application form to the Office of Instruction and Graduate Studies. Upon completion of program credit hour requirements, students will file a certificate request form that identifies completed coursework and initiates actions to produce official transcripts, leading to the award of the certificate. The curriculum consists of five technical courses including a capstone professional experience/synthesis course that will provide participants with a variety of skills supporting the technical aspects of the program. The capstone course will challenge students to use the skills they learned throughout the program and apply those skills to relevant business settings. Students will complete 15 credits hours of specific graduate coursework with an average grade of B or better.

Table 10. Suggested Courses for Advanced Certificate in Bioprocessing

Course	Number	Credits
Principles of Mass and Energy Balance	PSE 570	3
Transport Phenomena	BPE 335	3
Bioseparations	BPE 420	3
Bioreaction Engineering	BPE 421	3
Bioprocess Engineering Design	BPE 681	3

3.2 Radiation Curing Program | RCP

With the evolution of energy curing technologies, entire industries are changing. An increasing emphasis on UV (ultraviolet) and EB (electron beam) curing creates new opportunities for sustainable materials manufacturing. With this in mind, RadTech International, North America (RadTech) and the State University of New York College of Environmental Science and Forestry (SUNY-ESF) have partnered to create a program that bridges academic and professional development.

The Radiation Curing Program (RCP) helps both students and industry professionals capitalize on these emerging opportunities. Whether you are starting a new career, advancing in your current role, or simply want to better understand these technologies, RCP will help position you and your organization to lead the movement.

RCP incorporates online professional development short-courses that can be completed in 4-6 hours including:

- Principles of Energy Curing Technologies
- Basics of UV Curable 3D Printing

For those wanting more in-depth knowledge, RCP offers three advanced online courses that provide foundational and advanced treatment of current and emerging UV/EB curing principles and applications. These courses offer three 500-level credits each:

- Introduction to Polymer Coatings
- Radiation Curing of Polymer Technologies
- Radiation Curing Equipment, Instrumentation and Safety

These advanced courses may be taken for graduate credit or as non-credit professional development.

The Radiation Curing Program's online format is flexible and accommodates work, travel, and other commitments. This allows you and your organization to advance in this innovative and rapidly growing field in a convenient and cost-effective way. It is the perfect educational solution to complement in-house training for new and existing employees and for those wanting to learn more about the radiation curing field.

Introduction to Polymer Coatings

BPE 510 / 3 credits

Fundamental science of polymerization and film formation for a wide class of organic coatings, including acrylics, latexes, polyesters, amino resins, epoxies, alkyds, and silicon derivatives as well as the integration of appropriate binders and additives affecting coating quality. Reaction chemistries and their distinguishing characteristics for several cross-linking agents. Reaction kinetics are considered with emphasis on the influence of conditions during synthesis. Various organic coatings are compared based on desired mechanical and optical properties along with specific applications. The nature of defects and the resulting effect on product lifetime of coatings are examined.

Radiation Curing of Polymer Technologies

BPE 536 / 3 credits

Broad treatment of development and use of radiation curing of polymer technologies as they apply to industry-related roles such as chemists, engineers, technicians, and managers. Properties and development of free-radical and cationic systems initiated by various radiation sources. Chemical and physical underpinnings of common radiation curable materials and mechanisms.

Analysis techniques that monitor the cure reaction and the properties of cured material. Emphasis on the considerations and challenges in common applications of radiation curable polymer systems and associated costs, regulatory, and safety considerations.

Radiation Curing Equipment, Instrumentation and Safety

BPE 511 / 3 credits

Technologies used for commercial radiation curing for energy-efficient and environmentally-responsible curing of resins, inks, coatings and adhesives pertinent to industry chemists, engineers, technicians, and managers. Ultraviolet radiation (UV), electron beam (EB), radio frequency (RF) and Infrared (IR) generating systems, along with ancillary equipment used to quantify energy deposition. Basic equipment functions, interaction of radiation sources with specific substrates and chemistries, benefits and drawbacks of each technology, and safety and handling considerations. Emphasis is placed on effectively selecting and justifying equipment appropriate for specific applications.

4. Course Prerequisites

The catalog describes the prerequisites of each course offered at SUNY-ESF, especially for the courses with undergraduate resource shares. In general, graduate students are assumed to have satisfied these prerequisites as your admission is based on your BS degree that closely related to the field if not the same. For example, PSE 370 has as prerequisites PHY 211 and FCH 152. It also has a co-requisite of APM 206. Note that the prerequisites to PSE 370 themselves have prerequisites: FCH 150 is a prerequisite for FCH 152. Thus, in order to take PSE 370, a student must have taken APM 205, PHY 211, FCH 150, and FCH 152. A student must be currently enrolled in APM 206 or have previously taken it.

5. Study Abroad – International Experience

For general information: Visit 110 Bray Hall and check out the Study Abroad books as well as http://www.esf.edu/students/career/studyabroad.htm, Syracuse University's DIPA's website, and StudyAbroad.com.

Students wishing to go for a semester abroad to Germany and/or China, please see Drs. Doelle or Liu for more details. Germany (Munich) exchange program is available to Paper Science and Paper Engineering students. It is also available to Bioprocess Engineering students. Sichuan exchange program is open to everyone, but more focused on the lower division/general educational courses. Upper division courses will be available if demands permit.

ESF has an active exchange program with Sichuan University (Chengdu, Sichuan, China) and Beijing University of Chemical Technology (Beijing, China).

6. Engineering Code of Ethics

The faculty and staff in Paper and Bioprocess Engineering strongly believe that all members of the Department should adhere to the highest ethical standards in all professional and personal matters. To this end, the Department endorses the *Code of Ethics for Engineers* proposed by the National Society of Professional Engineers (www.nspe.org).
The details of the *Code of Ethics for Engineers* are given in Appendix I of this handbook.

7. Laboratory Safety

Safety is a continuous improvement process and your help is requested. We ask that you pay attention to safety issues and provide suggestions where we may improve. Please report any potentially dangerous condition such as a frayed electrical cord or leaking plumbing near electrical outlets.

PBE Safety Information Center, 102 Walters (east wall) contains MSDS, Sax's Hazardous Chemical Properties, the College Laboratory Safety and Chemical Hygiene Plan, and other safety related information. Material Safety Data Sheets (MSDS) contain information such as safe handling of chemicals and personal protection equipment (PPE) for each chemical used. Each student is expected to use this center prior to performing laboratory experiments.

In accordance with Department safety policy, before you begin work in the lab you will be required to sign a statement that you have attended the safety lecture and have read the laboratory safety information provided.

7.1 General Lab Safety

- Emergency response: familiarize yourself with exit locations, fire alarm boxes and telephones. Immediately report to your instructor any spill, injury, fire or other emergency. If your instructor is not immediately available, exit the lab and contact University Police at x6666. If the fire alarm sounds, proceed to the nearest exit at once and evacuate the building. Do not use the elevator.
- No food or drink in the labs
- Contain/tie-up long hair
- No shorts or sandals. Clothing must be suitable-not too loose, no dangling parts, etc.
- Work carefully and conscientiously. POSITIVELY NO HORSEPLAY
- Personal Protection Equipment (PPE) –eye protection issued, obtain appropriate gloves
- Eye safety protection is mandatory at all times when working in first floor lab(s)
- Eye goggles are mandatory when working with corrosive liquids
- Always add Acid to Water (A to W)
- All reagents and samples must be labeled if retained overnight (no chemical abbreviations are allowed)
- Wet floors pose a slipping hazard and an electrical hazard
- Several instruments use air under pressure. Report any loose air lines or leaks. An uncontrolled air stream can be hazardous.
- Some instrument preparations require the use of sharp blades. Use caution.
- Some instruments have pinch points. Use caution and keep fingers away.

8. Academic Advising

A primary goal of the Department of Paper and Bioprocess Engineering is to insure that all our students' progress through the academic programs in its intended course sequence while meeting all prerequisite requirements. Academic advising is the principle mechanism through which this goal is achieved. Successful academic advising is the result of cooperative efforts from both students and the major professor. Therefore it is important for students to discuss their course and registration with the major professor.

9. Student Email Accounts

SUNY-ESF, through Syracuse University, has established e-mail as a primary vehicle for official communication with students, faculty, and staff. An official e-mail address is established and assigned by Information and Technology Services (ITS) for each registered student. All University communications sent via e-mail will be sent to this address. Students are responsible for all messages sent to this email address. An account provides access to your space on a central computer system. Students, faculty and staff receive a free account from ITS for:

- Sending and receiving email
- Developing personal Web pages
- Logging in to public computers

To access your official e-mail address, you must first pick up your ITS computing account. To do that, go to the web site at http://its.syr.edu/netid. MyMail is the University's Web-based e-mail system that students use to access their official syr.edu e-mail address. Information about using MyMail is available on the Web at http://its.syr.edu/email/mymail. For further questions, contact the ITS Information Center at 443-2677, e-mail consult@syr.edu, or visit the Web at http://its.syr.edu.

Students may redirect their official syr.edu email to another address, such as hotmail.com, @Yahoo.com, or @aol.com. Syracuse University recommends that students access their official syr.edu email account by using MyMail. Students who choose to redirect their syr.edu email to another address do so at their own risk.

Before syr.edu email can be redirected to another account, users must first activate their ITS account. Information about activating your ITS account is on the Web at http://its.syr.edu/netid. After activating the ITS account, follow the directions provided at orientation to manage your account.

10. Syracuse Pulp and Paper Foundation

The Syracuse Pulp and Paper Foundation was established in 1960 to encourage young people to enroll in Paper Science and Paper Engineering at State University of New York College of Environmental Science and Forestry. The idea came from alumni and paper industry executives

who wanted to keep a steady supply of good, talented, well-trained engineers coming into the industry. They thought the best way to do that was to offer scholarships to deserving students. The PSE program has enjoyed generous support from industry ever since. Through the SPPF, the pulp, paper and allied industries make an investment in the students and their futures. That is one of the things that really sets this program apart from others.

The SPPF provides a means of liaison and communication between the College and the pulp, paper, and allied industries. Membership includes corporate sponsors, equipment donors, alumni donors, students, and interested individuals. The Foundation's Board of Directors are executives in the pulp, paper and allied industries. Standing committees composed of directors, corporate representatives, individual members, faculty members, and ESF administration advise the Board of Directors.

The Foundation office is maintained in 317 Walters Hall, and is staffed by Ms. Deborah DeWitt. For the up to date information related to SPPF, please visit http://www.esf.edu/pbe/sppf.

Appendices

A. Academic Calendar

B. Key PBE faculty, and Staff

C. Sample Forms
   - 2A
   - 3B (MPS), 3B (MS), 3B (PhD)
   - 4
   - Thesis Proposal Form (MS or PhD)
   - 6B
   - 5B
   - Full-time Status Form
   - Petition Form
   - S.C.O.R.E. Form

D. Code of Ethics for Engineers

Appendix A. Academic Calendar 2017-2020

Fall 2017

Classes Begin	August 28, Monday
Labor Day (no classes)	September 4, Monday
Last Day to add a class	September 5, Tuesday
Last Day to Drop a Class	September 22, Friday
Last day to drop a class with a grade of W	October 27, Friday
Advising for Spring 2018	October 30 – November 7, Monday-Tuesday
Registration for Spring 2018	November 8-December 15, Wednesday-Friday
Thanksgiving Recess	November 19-26, Sunday-Sunday
Last day to drop a class with a grade of W or WF	December 1, Friday
Last Day of Classes	December 8, Friday
Reading Days	December 9-10, Saturday-Sunday
Final Exams	December 11, Monday
Reading Day (a.m.)	December 12, Tuesday
Final Exams (p.m.)	December 12, Tuesday
Final Exams	December 13, Wednesday
Reading Day (a.m.)	December 14, Thursday
Final Exams (p.m)	December 14, Thursday
Final Exams	December 15, Friday

Spring 2018

Classes Begin	January 16, Tuesday
Last day to add a class	January 23, Tuesday
Last day to drop a class	February 9, Friday
Spring Break	March 11-18, Sunday-Sunday
Last day to withdraw from a class with a grade of W	March 20, Tuesday
Advising for Fall 2018	April 2-6, Monday-Friday
Registration for Fall 2018	April 9-May 9, Monday-Wednesday
Last day to withdraw from a class with a grade of W or WF	April 20, Friday
Last Day of Classes	May 1, Tuesday
Reading Day	May 2, Wednesday
Final Exams	May 3-4, Thursday-Friday
Reading Days	May 5-6, Saturday-Sunday
Final Exams	May 7-9, Monday-Wednesday
ESF May Commencement	May 12, Saturday
ESF/SU Joint Commencement	May 13, Sunday

Fall 2018

Classes begin	August 27, Monday
Labor Day (no classes)	September 3, Monday
Last day to add a class	September 4, Tuesday
Last day to drop a class	September 21, Friday
Last day to withdraw from a class with a grade of W	October 26, Friday
Advising for Spring 2019	October 29-November 6, Monday-Tuesday
Registration for Spring 2019	November 7-December 14, Wednesday-Friday
Thanksgiving Recess	November 18-25, Sunday-Sunday
Last day to withdraw from a class with a W or WF	November 30, Friday
December Commencement	December 7, Friday
Last day of classes	December 7, Friday
Reading days	December 8-9, Saturday-Sunday
Final Exams	December 10, Monday
Final Exam (p.m.)	December 11, Tuesday
Reading Day (a.m.)	December 11, Tuesday
Final Exams	December 12, Wednesday
Reading Day (a.m.)	December 13, Thursday
Final Exam (p.m.)	December 13, Thursday

Spring 2019

Classes Begin	January 14, Monday
Martin Luther King Day - no classes	January 21, Monday
Last day to add a class	January 22, Tuesday
Last day to drop a class	February 8, Friday
Spring break	March 10-17, Sunday-Sunday
Last day to withdraw from a class with a grade of W	March 19, Tuesday
Advising for Fall 2019	March 28-April 7, Thursday-Sunday
Registration for Fall 2019	April 8-May 8, Monday-Wednesday
Last day to withdraw from a class with a grade of W or WF	April 19, Friday
Last day of classes	April 30, Tuesday
Reading Day	May 1, Wednesday
Final exams	May 2-3, Thursday-Friday
Reading Days	May 4-5, Saturday-Sunday
Final exams	May 6-8, Monday-Wednesday
ESF May Commencement	May 11, Saturday

Fall 2019

Classes begin	August 26, Monday
Labor Day (no classes)	September 2, Monday
Last day to add a class	September 3, Tuesday
Last day to drop a class	September 20, Friday
Last day to withdraw from a class with a grade of W	October 25, Friday
Advising for Spring 2020	October 31-November 5, Thursday-Tuesday
Registration for Spring 2020	November 6-December 13, Wednesday-Friday
Thanksgiving Recess	November 24-December 1, Sunday-Sunday
Last day to withdraw from a class with a grade of W or WF	November 29, Friday
December Commencement	December 6, Friday
Last day of classes	December 6, Friday
Reading Days	December 7-8, Saturday-Sunday
Final Exams	December 9, Monday
Final Exams (p.m.)	December 10, Tuesday
Reading Days (a.m.)	December 10, Tuesday
Final Exams	December 11, Wednesday
Final Exams (p.m.)	December 12, Thursday
Reading Days (a.m.)	December 12, Thursday

Spring 2020

Classes Begin	January 13, Monday
Martin Luther King Day - no classes	January 20, Monday
Last day to add a class	January 21, Tuesday
Last day to drop a class	February 7, Friday
Last day to withdraw from a class with a grade of W	March 13, Friday
Spring Break	March 15-22, Sunday-Sunday
Advising for Fall 2020	March 26-April 5, Thursday-Sunday
Registration for Fall 2020	April 6-May 6, Monday-Wednesday
Last day to withdraw from a class with a grade of W or WF	April 17, Friday
Last day of classes	April 28, Tuesday
Reading Day	April 29, Wednesday
Final Exams	April 30-May 1, Thursday-Friday
Reading Days	May 2-3, Saturday-Sunday
Final Exams	May 4-6, Monday-Wednesday
ESF May Commencement	May 9, Saturday

Appendix B. PBE Faculty and Staff

Faculty Member	Office	Phone	Email
Dr. Gary M Scott *Chair* *Professor*	205 Walters	470-6501	gscott@esf.edu
Dr. Susan Anagnost *Director, NC Brown Center for Ultra Studies* *Professor*	211 Baker	470-6837	seanagno@esf.edu
Dr. Biljana Bujanovic *Associate Chair* *Associate Professor*	419 Walters	470-6907	bbujanovic@esf.edu
Mr. William Burry *Lecturer*	307 Walters	470-4779	wmburry@esf.edu
Dr. Siddharth Chatterjee *Associate Professor*	406 Walters	470-6517	schatterjee@esf.edu
Dr. Klaus Doelle *Associate Professor*	421 Walters	470-6531	kdoelle@esf.edu
Dr. Raymond C. Francis *Research Associate*	311 Walters	470-6525	francis@syr.edu
Dr. Rafaat Hussein *Associate Professor*	216 Baker	470-6833	rmhussei@esf.edu
Mr. Susumu Ikuta *Adjunct*	306 Walters	470-6520	Sus.ikuta@gmail.com
Dr. Yuan-Zong Lai *Professor*	428 Walters	470-6514	yzlai@syr.edu
Dr. Shijie Liu *Graduate Coordinator* *Professor*	302 Walters	470-6885	sliu@esf.edu
Dr. Robert Meyer *Undergraduate Coordinator* *Professor*	222 Baker	470-6881	rwmeyer@esf.edu
Dr. Noshir Mistry *Adjunct*	306 Walters	470-6520	Noshir.mistry@earthlink.net
Dr. Bandaru V. Ramarao *Director, ESPRI* *Professor*	310 Walters	470-6513	bvramara@syr.edu
Dr. William Smith *Director, Wood Utilization Service* *Professor*	218 Baker	470-6832	wbsmith@esf.edu
Emeritus Faculty			
Dr. Thomas E. Amidon	321 Walters	470-6524	teamidon@esf.edu
Staff Member			
Mr. Raymond J. Appleby *Pilot Plant Manager*	114 Walters	470-6527	rappleby@esf.edu
Ms. Deborah DeWitt *Syracuse Pulp and Paper Foundation*	315 Walters	470-6592	dkdewitt@esf.edu SPPF@esf.edu
Mr. Sean M. Hohm *Instructional Support Technician*	416 Walters	470-6587	smhohm@esf.edu
Ms. Lynn C. Mickinkle *PBE Department Secretary*	205 Walters	470-6501	lcmickin@esf.edu
Ms. Elizabeth *Kelly* Watson-Collins *Instructional Support Technician*	102 Walters Stockroom	470-6532	ekwatson@esf.edu
Mr. George Westby *Instructional Support Technician*	416 Walters	470-4952	grwestby@esf.edu

Appendix C: Sample Forms

The availability of the forms shown on the next several pages is given below. These forms can be found on
http://www.esf.edu/graduate/graddegreq.htm

Form 2A

Form 2A

STATE UNIVERSITY OF NEW YORK
COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY

Office of Instruction and Graduate Studies

Date: Click here for date.

TO: Scott Shannon
Dean, Instruction and Graduate Studies

FROM: Click here to enter name.
[Name of Department Chair or Graduate Program Coordinator]

SUBJECT: Appointment of Major Professor/Steering Committee

I recommend the following appointments for the student: Click here to enter name

Major Professor: Click here to enter name.

Steering Committee: Click here to enter name.

Click here to enter name.

I support the appointment of this committee:_____
[Signature]

For non-ESF faculty committee appointments, please include the full name, affiliation, and e-mail address of the appointee.

Revised: 1.6.2009

Form 3B (MPS)

State University of New York
College of Environmental Science and Forestry
Office of Instruction & Graduate Studies

Graduate Student Program of Study: Master of Professional Studies

Student: click here to enter name. Date: enter date

Department: click here to enter department.

Area of Study: click here to enter area of study

A. Coursework:

1. Graduate credits transferred from non-degree programs at other colleges or universities:

Course Number	Course Title	Credits
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
	Subtotal	cr. hrs.

2. Non-degree ESF graduate credits (maximum of 9 credits without petition):

Course Number	Course Title	Credits
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
	Subtotal	cr. hrs.
	Total transfer credits	cr. hrs.

3. Suggested Courses: The following listed courses are desirable to broaden the student's program but are **NOT required to meet minimum degree requirements:**

Course Number	Course Title	Credits
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
	Subtotal	cr. hrs.

3. Required Courses: The following courses (including topic seminars, but not including capstone seminar) are considered essential:

Course Number	Course Title	Credits
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
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course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
	Subtotal	cr. hrs.

Total Transfer & Required Course credits cr. hrs.

Total Internship or Synthesis credits (see area of study reqs.) cr. hrs.

Total number of credits (minimum of 30-42) cr. hrs.

B. Communication Skills

1. Technical writing ☐ Requirement completed Target semester for completing course click here to enter semester.

2. Library usage ☐ Requirement completed Target semester for completing course click here to enter semester.

C. Master's Study Integration

Target date for capstone seminar click here to enter semester.

D. Degree completion

Target semester for completion click here to enter semester.

Accepted by:

_____	_____
Major Professor	Student
_____	_____
Steering Committee member	Department Chair or Graduate Coordinator
_____	**For non-ESF faculty committee appointments, please include the full name, affiliation, and address of the appointee.**
Steering Committee member	

cc: Department Chair
Major Professor
Dean of Instruction and Graduate Studies
Student
Registrar
CRT_____

Revised: 3.10.2010

State University of New York
College of Environmental Science and Forestry
Office of Instruction & Graduate Studies

Graduate Student Program of Study: Master of Science

Student: Date:

Department:

Area of Study:

A. **Coursework**

1. Graduate credits transferred from non-degree programs, excluding ESF:

Course Number	Course Title	Credits

Subtotal _____

2. Non-degree ESF graduate credits (maximum of 9 credits without petition):

Course Number	Course Title	Credits

Subtotal _____

Total Transfer Credits _____

3. Suggested Courses: The following listed courses are desirable to broaden the student's program but are **NOT required to meet minimum degree requirements:**

Course Number	Course Title	Credits

Subtotal: _____

3B – MS Student Name:

4. Required Courses: The following courses (including topic seminars, but not including capstone seminar) are considered essential:

Course Number	Course Title	Credits
	Subtotal	

Total Transfer and Required Coursework Credits (minimum of 18-24*) _____

Total Thesis (899) Credits (minimum of 6) _____

Total Number of Credits (minimum of 30-36*) _____

**See departmental requirements*

3B – MS Student Name:

B. Communication Skills — Target Semester for Completion:

1. Technical Writing ☐ complete _____

2. Library Usage ☐ complete _____

C. Master's Study Integration

1. Thesis proposal and defense target semesters

Target semester for proposal: _____

Target semester for capstone seminar: _____

Target semester for defense: _____

Accepted by:

_____ Major Professor

_____ Student

_____ Steering Committee member

_____ Department Chair or Graduate Coordinator

_____ Steering Committee member

For non-ESF faculty committee appointments, please include the full name, affiliation, AND EMAIL of the appointee.

cc: Department Chair
Major Professor
Dean of Instruction and Graduate Studies
Student
Registrar
CRT_____

Revised: 2/3/12

Form 3B (PhD)

State University of New York
College of Environmental Science and Forestry
Office of Instruction & Graduate Studies

Graduate Student Program of Study: Doctor of Philosophy

Student: click here to enter name. Date: enter date

Department: click here to enter department.

Area of Study: click here to enter area of study

A. **Coursework**

1. Transfer credits: The following courses have already been completed and should be transferred to meet doctoral degree requirements at ESF.

a. Graduate credits transferred from previous Master's degree (may not exceed 30 credits of coursework – no thesis credits):

Course Number	Course Title	Credits
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
	Subtotal a.	cr. hrs.

b. Graduate credits transferred from non-degree programs, excluding ESF:

Course Number	Course Title	Credits
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
	Subtotal b.	cr. hrs.

c. Non-degree ESF graduate credits (maximum of 9 credits without petition):

Course Number	Course Title	Credits
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
	Subtotal c.	cr. hrs.
	Total (a + b + c) Transfer credits	cr. hrs.

2. Suggested Courses: The following listed courses are desirable to broaden the student's program but are **NOT required to meet minimum degree requirements:**

Course Number	Course Title	Credits
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
	Subtotal	cr. hrs.

3. Required Courses: The following courses (including topic seminars, but not including capstone seminar) are considered essential:

Course Number	Course Title	Credits
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
course #	click here to enter course title.	cr. hrs.
	Subtotal	cr. hrs.

Total Transfer Coursework Credits cr. hrs.

Total Required Course credits cr. hrs.

Total Transfer & Required Course credits (must be 30-48) cr. hrs.

Total Dissertation credits (must be 12-30) cr. hrs.

Total number of credits (min. of 60) cr. hrs.

B. Communication Skills

1. Technical Writing — target semester for completing course:

   ☐ complete — click here to enter semester.

2. Library Usage — target semester for completing course:

   ☐ complete — click here to enter semester.

C. Preliminary examination

Target semester for examination click here to enter semester.

D. Research tool(s

Tool enter tool. Target semester for completion click here to enter semester.

Tool enter tool. Target semester for completion click here to enter semester.

E. Candidacy examination

Target semester click here to enter semester.

F. Dissertation

Target semester for proposal click here to enter semester.

Target semester for capstone seminar click here to enter semester.

Target semester for defense click here to enter semester.

Accepted by:

_____	_____
Major Professor	Student
_____	_____
Steering Committee member	Department Chair or Graduate Coordinator
_____	**For non-ESF faculty committee appointments, please include the full name, affiliation, and address of the appointee.**
Steering Committee member	

cc: Department Chair
Major Professor
Dean of Instruction and Graduate Studies
Student
Registrar
CRT_____

Revised: 3.8.2010

Doctorate Students' Guidelines for Filing Graduate Program of Study (3B Form)

Your program of study must include the sequence of courses you must complete and a plan for your research. The program of study, developed by you with the advice and approval of your major professor and other members of your steering committee, must be submitted to your Department Chair for approval, and then forwarded to the Dean of Instruction and Graduate Studies at least by the end of your third semester. This program of study can be changed during the course of your studies via petition, Form 4, or online through the student portal. Changes must be approved by the major professor, Department Chair, and the Dean of Instruction and Graduate Studies.

The following summarizes the program requirements which must be completed before a graduate degree will be awarded:

Doctor of Philosophy Degree

General Requirements

The Doctor of Philosophy degree is an academic degree offered in the following degree programs: Environmental and Forest Chemistry, Environmental and Forest Biology, Forest Resources Management, Environmental and Resource Engineering, and Environmental Science. The Doctor of Philosophy (Ph.D.) degree requires a minimum of 60 graduate credits, of which 30 to 48 credits are for coursework and 12 to 30 credits are awarded for thesis. Individual departments will determine the applicable credit hour requirements within these ranges to reflect individual program requirements and emphases. The graduate credits earned for a Master's Degree that are applicable to a student's doctoral study plan are determined on an individual basis by the steering committee. The student must pass the doctoral candidacy examination covering selected fields of study at least one year prior to dissertation defense, and successfully defend the dissertation. The dissertation must be prepared according to College standards and will be deposited in Moon Memorial Library.

Doctoral Preliminary Examination

The requirement for this examination is determined by individual departments. The purpose of this examination is to assess the entering student's basic knowledge in the chosen field of study. The results of this examination may be used to determine the student's suitability for the doctoral program and as a guide in selecting coursework and developing a program of study.

Tool Requirements

Doctoral students must demonstrate competence in at least one research tool as a requirement for graduation. Such tools include statistics, computer science, or the ability to translate technical articles in a language other than English commonly used in science. Tool requirements and standards for each doctorate program will be determined by the corresponding program department.

Communication Skills

All students entering graduate programs at ESF are expected to be proficient in communication skills, including technical writing and library skills. Students are required to have completed at least one course in technical writing and one course in library usage, either as an undergraduate or as a graduate student. Credits for such courses taken during the graduate program are not counted towards degree requirements. Alternatively, graduate students can meet the requirement by demonstrating the equivalent in experience in writing and library skills, as determined by the steering committee.

Seminars

Participation in seminars, including the preparation and presentation of technical material, is vital to the student's graduate education. All graduate students at ESF are required to participate in graduate seminars, as follows:

Each graduate student is expected to participate in topic seminars, including presentations, as determined by the individual department. This requirement can be fulfilled, with appropriate approval, by seminars offered at Syracuse University or the SUNY Health Sciences Center.

Students completing the Ph.D. degree are required to present a "capstone seminar" on their dissertation. The purpose of the capstone seminar is to provide an opportunity for the graduate student to present technical information to a critical body of professionals and peers. This seminar will be presented prior to the dissertation defense and should be attended by the student's steering committee. Each seminar is open to the College community and will be announced College-wide to encourage attendance by students and faculty.

Academic Performance

All graduate students are required to maintain at least a 3.000 cumulative grade point average (4.000 =A) for graduate level courses. Students who do not maintain this average, or who receive two or more grades of Unsatisfactory (U) for work on the dissertation, will be placed on probation or suspended from ESF by the Dean of Instruction and Graduate Studies upon the recommendation of the College Subcommittee on Academic Standards.

Credit Hour Load

To meet academic requirements, graduate students must be registered for at least one credit each semester, excluding summers, from the first semester of matriculation until all degree requirements have been completed. Failure to register for each semester will result in the student being withdrawn from graduate study and, if the student wishes to return in the future, a new application must be filed and reviewed prior to readmission. Audited courses may not be used to satisfy full-time status. Students are required to register for at least one credit of thesis/dissertation research, professional experience, or independent study in the summer if they will complete all requirements during that time. There is no full-time credit-hour load to meet academic requirements.

Graduate students who hold an assistantship and/or a tuition scholarship must be in full-time status each semester while holding such an award. Registration for nine credits usually equates to full-time status for a student holding an assistantship. Graduate students not holding an assistantship are considered full-time if they are registered for at least 12 credits each semester.

Doctoral candidates (i.e., those who have successfully completed their doctoral candidacy examination), master's students (M.F., M.P.S., M.L.A. and M.F.) who have met all academic requirements, and master of science (M.S.) students who have requested the appointment of a defense committee and intend to defend a thesis may be considered full time if registered for at least one credit of thesis/dissertation research, professional experience, or independent study and submit a "Request for Full-time Certification Form" to the Office of Instruction and Graduate Studies.

Transfer Credit

Credit hours appropriate to the graduate degree in which a minimum grade of B was earned from an accredited institution can be transferred to the college, but grades and grade points cannot be transferred.

Up to six credits of graduate coursework **not used to complete another degree** may be accepted toward completion of a master's or doctoral degree as approved by the steering committee**.**

Up to thirty credits of graduate level coursework **earned as part of a conferred master's degree** may be transferred (by petition) to a doctoral degree with approval of the steering committee.

Students may transfer no more than nine credits of credit-bearing **non-degree ESF** coursework to graduate degree programs.

All transfer credit will remain tentative until official, final transcripts are received. It is the student's responsibility to ensure that official, final transcripts are sent to and received by the college.

Time Limits

For the doctoral degree, students must complete the candidacy exam within three years of the first date of matriculation. Doctoral candidates must complete all degree requirements within three years of passing the doctoral candidacy examination, or they will be required to retake the candidacy examination.

Updated: 09/26/2011

Form 4

ESF

STATE UNIVERSITY OF NEW YORK
COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY
Office of Instruction and Graduate Studies

FORM 4

Revision to Existing Program of Study (3B)

Student's Name: _____ Date: _____
First MI Last

Graduate Degree: _____ Dept./Area of Study: _____ Anticipated Graduation Semester: _____

This form is to be used when requesting deletion, addition or substitution of course(s) or committee member(s) on an existing Program of Study. Please attach additional sheets if necessary.

Change in Courses

Courses to Remove			Courses to Add or Substitute		
Course #	**Course Name/Term**	**Cr. Hrs.**	**Course #**	**Course Name/Term**	**Cr. Hrs.**

Change in Committee Members (If Applicable)

Member(s) to be Removed (*Note: Current members to be removed should sign to indicate agreement.*):

_____ _____
Member Name (Signature)

_____ _____
Member Name (Signature)

_____ _____
Member Name (Signature)

Member(s) to be Added (*Attach address information for non-ESF faculty*):

_____ _____
Member Name (Signature)

_____ _____
Member Name (Signature)

_____ _____
Member Name (Signature)

_____
Student (Signature) Date

Approved by:

_____ _____
Major Professor (Signature) Date

_____ _____
Department Chair or Coordinator (Signature) Date

c: Department
Registrar
Student
OIGS Student Record
CRT_____

April 2010

SUNY ESF |The Graduate School

Thesis or Dissertation Proposal Approval Form

Student Name: **Student ID#:**

Department:-DEPARTMENT- **Degree Level:** -DEGREE- **Program Entry Date:**

MS Thesis or PhD Dissertation Proposal Policy:

All students participating in a Master of Science or Doctor of Philosophy degree program must complete a thesis or dissertation proposal for approval by the members of the student's steering committee. The major professor and each of the graduate steering committee members must approve the proposal using the Graduate School's proposal approval form. MS thesis proposals should generally be completed two semesters prior to defense of the thesis; PhD dissertation proposals must be completed to achieve candidacy (in concert or in parallel with the candidacy examination process). Each Department/Program may have requirements that exceed those specified broadly in this policy; however, they must be consistent with the Graduate School's requirements. Departmental requirements beyond the minimum stated here must be specified in writing and submitted to the Graduate School as well as listed in departmental web pages. It is the responsibility of the student to be aware of, and comply with, all Graduate School and Departmental dissertation proposal requirements.

By signing this form, all parties agree that the requirement for submitting a research proposal has been satisfied. Future amendments do not need official approval through the Graduate School.

Student Signature: _____ **Date:** _____

Major Professor Signature: _____ **Date:** _____

Co-Major Professor Signature: _____ **Date:** _____
(if applicable)

Steering Committee Signature: _____ **Date:** _____

Steering Committee Signature: _____ **Date:** _____

Print Form

Return completed form to the Graduate School, 227 Bray Hall

c: Department, Student File

Research Proposal Approval Form 10/14

Form 6B

STATE UNIVERSITY OF NEW YORK
COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY

Date: Click here for date.

TO: Scott Shannon
Dean, Instruction and Graduate Studies

FROM: Click here to enter name.
Department Chairperson

SUBJECT: Request to Appoint Doctoral Candidacy Examination Committee and Committee Chair

As the Department Chair for the student noted below, I recommend you appoint the following doctoral candidacy examination committee:

Student: Click here to enter name.

Examination Committee:

Major Professor: Click here to enter name.

Steering Committee: Click here to enter name.

Examiner(s):* Click here to enter name.

***** At least one additional faculty member from an appropriate area is required. Include e-mail address(s) of any non-ESF faculty.

****

To be completed by OI&GS:
Committee Chair: _____

Form 5B

STATE UNIVERSITY OF NEW YORK
COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY

Office of Instruction and Graduate Studies

Date:

TO: **S.** Scott Shannon
Dean, Instruction and Graduate Studies

FROM:
Department Chair

SUBJECT: Request to Appoint Defense of Thesis/Dissertation Examination Committee

As the Department Chair for the student noted below, I recommend you appoint the following defense of thesis/dissertation examination committee, including the defense committee chair who is not a member of our department:

Student: _____

Examination Committee:

Major Professor: _____

Steering Committee: _____

_____

_____

_____

Examiner(s):* _____

_____

_____

Thesis or Dissertation Title:

_____

_____

_____

* At least one additional faculty member is required for the master's degree examination and at least two additional faculty members or other qualified persons for doctoral degree examination.

****

To be completed by OI&GS:
Defense Committee Chair: _____

STATE UNIVERSITY OF NEW YORK
COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY
SYRACUSE, NEW YORK 13210

CERTIFICATION OF FULL-TIME STATUS FOR GRADUATE STUDENTS

SUNY-ESF considers you a full-time student and the Registrar can confirm your full-time status if you are matriculated in a graduate degree program and meet one of the following criteria for the semester in which certification of full-time status is required:

1. You are registered for 12 credit hours, or
2. You hold an appointment as a graduate assistant or research assistant, or hold a graduate fellowship and are registered for at least 9 credit hours for the given semester.

If you do not meet the standards for full-time registration as established by the College, your major professor can recommend that the Office of Instruction and Graduate Studies certify you for full-time status based on the following criteria:

- Matriculation in a master's degree program and a) has completed all academic requirements (coursework and thesis/internship where appropriate); b) is in the final semester; and c) is registered for at least one credit of thesis research, professional experience or independent study.
- Matriculation in a doctoral degree program, has successfully completed coursework requirements and the doctoral candidacy exam, and is registered for at least one credit of dissertation research.

Name:_____
(Last) (First) (M.I.)

SSN:_____ Semester & Year:_____

Address:_____

Degree Program: _____Master's _____Doctoral

I verify that the above-named student meets the criteria established for full-time status with registration for less than 12 credit hours:

Major Professor's
Endorsement:_____
(Signature) (Date)

I verify that the above information is
accurate:_____
(Student signature) (Date)

Approval by the Office of Instruction and Graduate
Studies:_____
(Signature) (Date)

SUNY ESF |The Graduate School
Petition for Extension of Time Limit for Degree Completion

Student Name: **Student ID#:**

Department: PBE **Degree Level:** -DEGREE- **Program Entry Date:**

ESF's catalog details the degree completion limits for all graduate students. In brief, the policies are as follows:

Time Limits

"Graduate students must complete all requirements for the master of forestry, master of professional studies, the master of landscape architecture, and the Master of Science degree within four years of the first date of matriculation or they may be withdrawn from graduate study. For the doctoral degree, students must complete the candidacy exam within three years of the first date of matriculation. Students must pass the doctoral candidacy examination covering selected fields of study at least one year prior to dissertation defense. Doctoral candidates must successfully defend the dissertation and complete all degree requirements within seven years of matriculation, or they will be required to retake the candidacy examination or be withdrawn from their program of graduate study."

Should a student anticipate not being able to meet the time limit, or if the time limit has already expired, the following information is required for review and consideration.

Briefly explain progress to date:

Briefly explain work to be completed:

Anticipated Completion Date: -MONTH- -YEAR-

Student Signature: _____ **Date:** _____

Major Professor Signature: _____ **Date:** _____

Co-Major Professor Signature: _____ **Date:** _____
(if applicable)

Graduate Chair/Coordinator's Signature: _____ **Date:** _____

c: Department, Registrar, Student File

Registration (SCORE) form

SUNY ESF S.C.O.R.E. / Registration Course Selection Form

Student ID	Last Name	First Name
SSN	Program of Study	For what term and year are you registering?

Class Number	Dept Prefix	Course Number	Section Number	Course Title	Credit Hours	Audit	A=Add D=Drop	Instructor Signature

Total Hours _____

I expect to graduate in (circle one) MAY AUG DEC _____ Year

_____ _____ _____

Student Signature Advisor / Major Professor Date

REGISTRAR COPY

SUNY COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY

Undergraduate Student
Degree Program _____
Class Level _____

Graduate Student
Degree Program _____
Degree Sought _____

PETITION TO THE FACULTY

Name (Print) _____ Signature _____
Local Address _____ Social Security Number _____
_____ Date _____

Request:

Justification for Request:

Instructor's signature required for late drops/adds and extension of incompletes.

_____
Signature Date

RECOMMENDATIONS

Advisor/Major Professor Comments _____
Signature _____ Approved ____ _____
Date _____ Disapproved ____ _____

Faculty Committee/Coordinator Comments _____
Signature _____ Approved ____ _____
Date _____ Disapproved ____ _____

Faculty Chairman Comments _____
Signature _____ Approved ____ _____
Date _____ Disapproved ____ _____

FINAL ACTION

Committee on Instruction/Dean, Instruction and Graduate Studies
Comments _____
Signature _____ Approved ____ _____
Date _____ Disapproved ____ _____

Recorded PRC ____ **CRT** ____

REGISTRAR

Appendix D: Code of Ethics for Engineers

National Society of Professional Engineers®

Code of Ethics for Engineers

Preamble

Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the highest standards of honesty and integrity. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

I. Fundamental Canons

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health, and welfare of the public.
2. Perform services only in areas of their competence.
3. Issue public statements only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

II. Rules of Practice

1. Engineers shall hold paramount the safety, health, and welfare of the public.
   a. If engineers' judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate.
   b. Engineers shall approve only those engineering documents that are in conformity with applicable standards.
   c. Engineers shall not reveal facts, data, or information without the prior consent of the client or employer except as authorized or required by law or this Code.
   d. Engineers shall not permit the use of their name or associate in business ventures with any person or firm that they believe is engaged in fraudulent or dishonest enterprise.
   e. Engineers shall not aid or abet the unlawful practice of engineering by a person or firm.
   f. Engineers having knowledge of any alleged violation of this Code shall report thereon to appropriate professional bodies and, when relevant, also to public authorities, and cooperate with the proper authorities in furnishing such information or assistance as may be required.
2. Engineers shall perform services only in the areas of their competence.
   a. Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved.
   b. Engineers shall not affix their signatures to any plans or documents dealing with subject matter in which they lack competence, nor to any plan or document not prepared under their direction and control.
   c. Engineers may accept assignments and assume responsibility for coordination of an entire project and sign and seal the engineering documents for the entire project, provided that each technical segment is signed and sealed only by the qualified engineers who prepared the segment.
3. Engineers shall issue public statements only in an objective and truthful manner.
   a. Engineers shall be objective and truthful in professional reports, statements, or testimony. They shall include all relevant and pertinent information in such reports, statements, or testimony, which should bear the date indicating when it was current.
   b. Engineers may express publicly technical opinions that are founded upon knowledge of the facts and competence in the subject matter.
   c. Engineers shall issue no statements, criticisms, or arguments on technical matters that are inspired or paid for by interested parties, unless they have prefaced their comments by explicitly identifying the interested parties on whose behalf they are speaking, and by revealing the existence of any interest the engineers may have in the matters.
4. Engineers shall act for each employer or client as faithful agents or trustees.
   a. Engineers shall disclose all known or potential conflicts of interest that could influence or appear to influence their judgment or the quality of their services.
   b. Engineers shall not accept compensation, financial or otherwise, from more than one party for services on the same project, or for services pertaining to the same project, unless the circumstances are fully disclosed and agreed to by all interested parties.
   c. Engineers shall not solicit or accept financial or other valuable consideration, directly or indirectly, from outside agents in connection with the work for which they are responsible.
   d. Engineers in public service as members, advisors, or employees of a governmental or quasi-governmental body or department shall not participate in decisions with respect to services solicited or provided by them or their organizations in private or public engineering practice.
   e. Engineers shall not solicit or accept a contract from a governmental body on which a principal or officer of their organization serves as a member.
5. Engineers shall avoid deceptive acts.
   a. Engineers shall not falsify their qualifications or permit misrepresentation of their or their associates' qualifications. They shall not misrepresent or exaggerate their responsibility in or for the subject matter of prior assignments. Brochures or other presentations incident to the solicitation of employment shall not misrepresent pertinent facts concerning employers, employees, associates, joint venturers, or past accomplishments.
   b. Engineers shall not offer, give, solicit, or receive, either directly or indirectly, any contribution to influence the award of a contract by public authority, or which may be reasonably construed by the public as having the effect or intent of influencing the awarding of a contract. They shall not offer any gift or other valuable consideration in order to secure work. They shall not pay a commission, percentage, or brokerage fee in order to secure work, except to a bona fide employee or bona fide established commercial or marketing agencies retained by them.

III. Professional Obligations

1. Engineers shall be guided in all their relations by the highest standards of honesty and integrity.
   a. Engineers shall acknowledge their errors and shall not distort or alter the facts.
   b. Engineers shall advise their clients or employers when they believe a project will not be successful.
   c. Engineers shall not accept outside employment to the detriment of their regular work or interest. Before accepting any outside engineering employment, they will notify their employers.
   d. Engineers shall not attempt to attract an engineer from another employer by false or misleading pretenses.
   e. Engineers shall not promote their own interest at the expense of the dignity and integrity of the profession.
2. Engineers shall at all times strive to serve the public interest.
   a. Engineers shall seek opportunities to participate in civic affairs; career guidance for youths; and work for the advancement of the safety, health, and well-being of their community.
   b. Engineers shall not complete, sign, or seal plans and/or specifications that are not in conformity with applicable engineering standards. If the client or employer insists on such unprofessional conduct, they shall notify the proper authorities and withdraw from further service on the project.
   c. Engineers shall endeavor to extend public knowledge and appreciation of engineering and its achievements.
3. Engineers shall avoid all conduct or practice that deceives the public.
   a. Engineers shall avoid the use of statements containing a material misrepresentation of fact or omitting a material fact.
   b. Consistent with the foregoing, engineers may advertise for recruitment of personnel.
   c. Consistent with the foregoing, engineers may prepare articles for the lay or technical press, but such articles shall not imply credit to the author for work performed by others.
4. Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve.
   a. Engineers shall not, without the consent of all interested parties, promote or arrange for new employment or practice in connection with a specific project for which the engineer has gained particular and specialized knowledge.

b. Engineers shall not, without the consent of all interested parties, participate in or represent an adversary interest in connection with a specific project or proceeding in which the engineer has gained particular specialized knowledge on behalf of a former client or employer.

5. Engineers shall not be influenced in their professional duties by conflicting interests.
   a. Engineers shall not accept financial or other considerations, including free engineering designs, from material or equipment suppliers for specifying their product.
   b. Engineers shall not accept commissions or allowances, directly or indirectly, from contractors or other parties dealing with clients or employers of the engineer in connection with work for which the engineer is responsible.
6. Engineers shall not attempt to obtain employment or advancement or professional engagements by untruthfully criticizing other engineers, or by other improper or questionable methods.
   a. Engineers shall not request, propose, or accept a commission on a contingent basis under circumstances in which their judgment may be compromised.
   b. Engineers in salaried positions shall accept part-time engineering work only to the extent consistent with policies of the employer and in accordance with ethical considerations.
   c. Engineers shall not, without consent, use equipment, supplies, laboratory, or office facilities of an employer to carry on outside private practice.
7. Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice, or employment of other engineers. Engineers who believe others are guilty of unethical or illegal practice shall present such information to the proper authority for action.
   a. Engineers in private practice shall not review the work of another engineer for the same client, except with the knowledge of such engineer, or unless the connection of such engineer with the work has been terminated.
   b. Engineers in governmental, industrial, or educational employ are entitled to review and evaluate the work of other engineers when so required by their employment duties.
   c. Engineers in sales or industrial employ are entitled to make engineering comparisons of represented products with products of other suppliers.
8. Engineers shall accept personal responsibility for their professional activities, provided, however, that engineers may seek indemnification for services arising out of their practice for other than gross negligence, where the engineer's interests cannot otherwise be protected.
   a. Engineers shall conform with state registration laws in the practice of engineering.
   b. Engineers shall not use association with a nonengineer, a corporation, or partnership as a "cloak" for unethical acts.
9. Engineers shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others.
   a. Engineers shall, whenever possible, name the person or persons who may be individually responsible for designs, inventions, writings, or other accomplishments.
   b. Engineers using designs supplied by a client recognize that the designs remain the property of the client and may not be duplicated by the engineer for others without express permission.
   c. Engineers, before undertaking work for others in connection with which the engineer may make improvements, plans, designs, inventions, or other records that may justify copyrights or patents, should enter into a positive agreement regarding ownership.
   d. Engineers' designs, data, records, and notes referring exclusively to an employer's work are the employer's property. The employer should indemnify the engineer for use of the information for any purpose other than the original purpose.
   e. Engineers shall continue their professional development throughout their careers and should keep current in their specialty fields by engaging in professional practice, participating in continuing education courses, reading in the technical literature, and attending professional meetings and seminars.

As Revised January 2003

"By order of the United States District Court for the District of Columbia, former Section 11(c) of the NSPE Code of Ethics prohibiting competitive bidding, and all policy statements, opinions, rulings or other guidelines interpreting its scope, have been rescinded as unlawfully interfering with the legal right of engineers, protected under the antitrust laws, to provide price information to prospective clients; accordingly, nothing contained in the NSPE Code of Ethics, policy statements, opinions, rulings or other guidelines prohibits the submission of price quotations or competitive bids for engineering services at any time or in any amount."

Statement by NSPE Executive Committee

In order to correct misunderstandings which have been indicated in some instances since the issuance of the Supreme Court decision and the entry of the Final Judgment, it is noted that in its decision of April 25, 1978, the Supreme Court of the United States declared: "The Sherman Act does not require competitive bidding."

It is further noted that as made clear in the Supreme Court decision:

1. Engineers and firms may individually refuse to bid for engineering services.
2. Clients are not required to seek bids for engineering services.
3. Federal, state, and local laws governing procedures to procure engineering services are not affected, and remain in full force and effect.
4. State societies and local chapters are free to actively and aggressively seek legislation for professional selection and negotiation procedures by public agencies.
5. State registration board rules of professional conduct, including rules prohibiting competitive bidding for engineering services, are not affected and remain in full force and effect. State registration boards with authority to adopt rules of professional conduct may adopt rules governing procedures to obtain engineering services.
6. As noted by the Supreme Court, "nothing in the judgment prevents NSPE and its members from attempting to influence governmental action . . ."

Note:

In regard to the question of application of the Code to corporations vis-a-vis real persons, business form or type should not negate nor influence conformance of individuals to the Code. The Code deals with professional services, which services must be performed by real persons. Real persons in turn establish and implement policies within business structures. The Code is clearly written to apply to the Engineer, and it is incumbent on members of NSPE to endeavor to live up to its provisions. This applies to all pertinent sections of the Code.

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Publication date as revised: January 2003 • Publication #1102