State University of New York
College of Environmental Science and Forestry

Department of

Chemical Engineering

Graduate Student Handbook Supplement

Degree Programs:

Bioprocess Engineering (MPS, MS, PhD)
Biomaterials Engineering (MS, PhD)
Paper Science and Engineering (MPS, MS, PhD)
Sustainable Engineering Management (MPS): SEM-PSE, SEM-BPE
Wood Science (MPS, MS, PhD)

Non-Degree Programs:

Advanced Certificate in Bioprocessing
Advanced Certificate in Radiation Curing

August 2020

Revision History

V1.00	August 15, 2017	Paper and Bioprocess Engineering, Wood Products
V2.00	August 15, 2018	Elevation to programs updated
V3.00	August, 2019	Wood Science updated, and more
V4.00	August, 2020	Updated for Chemical Engineering

Table of Contents

Introduction to the Graduate Student Handbook

This handbook provides important information concerning the policies, regulation, and practices of the Department of Chemical 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 five graduate programs (Biomaterials Engineering, Bioprocess Engineering, Paper Science and Engineering, Sustainable Engineering Management, and Wood Science).

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 since its first version in 2017 that was based on the Handbook written by Professor Bandaru V. Ramarao and MPS program information provided by Professor Gary M. Scott, and the ESF College Catalog online regarding the respective programs / curricula.

Prof. Shijie Liu

Mission, Program Objectives, and Program Learning Outcomes

The mission of the Department of Chemical Engineering is:

- To develop well-educated and skilled engineers for technical and leadership careers in the chemical, materials, energy and allied industries with special focus on biological pharmaceuticals, biomolecular engineering, bioresources, bioenergy, packaging, pulp, paper 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 biomolecular products, packaging and pulp 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 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. Selection of Major Professor

All graduate students are free to select their major professor(s). When you are admitted to CE, you have been temporally assigned a major professor, in most cases based on your earlier indication of whom you would like to be your major professor. This assignment is not permanent as you are encouraged to choose your major professor(s) after you have some chances to interact with the professors in the department.

Here are some of the factors you may consider when choosing your major professor:

A. Your career goal
B. Area of specialty
C. Project availability
D. Funding
E. Other factors

2.Graduate Degree Programs and Minimum Requirements

Currently, the department offers MPS, PM and PhD degrees in five programs of study. Not all programs offer all three degrees:

Graduate Program of Study	MPS	MS	PhD
Biomaterials Engineering (BME)		X	X
Bioprocess Engineering (BPE)	X	X	X
Paper Science and Engineering (PSD)	X	X	X
Sustainable Engineering Management (SEM)	X		
Wood Science (WS)	X	X	X

Master of Professional Studies or MPS is 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 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.

Table 1. Core Courses

Core Course Group

Program	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	Papermaking Processes Pulping & Bleaching	Paper Properties Paper Physics Packaging Tissue
SEM	This area of study subdivides into BPE and PSE, which then follow with the core requirements above.		
WS	Composite Materials Tropical Timbers	Fluid Transport Wood Biodegradation Microtechnique Light Microscopy	Wood Properties Scanning Electron Microscopy Transmission Electron Microscopy

2.1 The Master 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 Department of Paper and Bioprocess Engineering offers four MPS programs:

- Bioprocess Engineering
- Paper Science and Engineering
- Sustainable Engineering Management, with options in Paper and Bioprocess
- Wood Science

2.2 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. These are four programs available in the department:

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

Graduate studies reflect the strong trend toward diversification in the industry and offer opportunities for study in a variety of subjects related to bioprocess, biomaterials, and 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.

2.3 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.

3. Curricula of Degree Programs

3.1 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 biochemical, bioprocess, wood products, the pulp, paper and allied 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:

3.1.1 Bioprocess Engineering (BPE)

This program 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 Bioprocess Engineering 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	**Courses**	**Core Course**	**Credit Hours**	**Semester**
PSE 570	Principles of Mass and Energy Balances	•	3	Fall-Semester 1
BPE 620	Bioseparations	•	3	Fall-Semester 1
	Elective (PSE 571 Fluid Mechanics recommended)		3	
BPE 300	Introduction to Bioprocessing (recommended audit)		--	Fall-Semester 1
BPE 535	Transport Phenomena	•	3	Spring-Semester 2
	Elective		3	Spring-Semester 2
	Elective		3	Spring-Semester 2
BPE 898	Professional Synthesis		3	Summer
BPE 321	Bioreaction Engineering	•	3	Fall-Semester 3
	Elective		3	Fall-Semester 3
	Elective		3	Fall-Semester 3

3.1.2 Paper Science and Engineering (PSE)

This program deals 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	12
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	**Courses**	**Core Course**	**Credit Hours**	**Semester**
PSE 570	Principles of Mass and Energy Balances	•	3	Fall-Semester 1
PSE 665	Fiber and Paper Properties	•	3	Fall-Semester 1
	Elective		3	
PSE 200	Introduction to Papermaking (recommended audit)		--	Fall-Semester 1
PSE 668	Papermaking Processes	•	6	Spring-Semester 2
PSE 550	Fiber Processing	•	3	Spring-Semester 2
PSE 898	Professional Synthesis		3	Summer
	Elective		3	Fall-Semester 3
	Elective		3	Fall-Semester 3
	Elective		3	Fall-Semester 3

3.1.3 Sustainable Engineering Management (SEM)

This program 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.

3.1.3.1 Bioprocess Engineering or SEM – BPE

One option within the MPS Sustainable Engineering Management (SEM) program is the Bioprocess Engineering. Effectively, this option is a PSM program in Bioprocess Engineering.

Table 6. SEM – BPE Minimum Requirements

Number of Credits	**30**
Core credits	12
Plus courses	12
Elective credits	6 – 9
Professional experience	3 - 6

The purpose of the SEM-BPE program option 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 SEM – BPE

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

3.1.3.2 Paper Science and Engineering or SEM – PSE

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

Table 8. SEM – PSE Minimum Requirements

Number of Credits	**30**
Core credits	15
Plus courses	12
Elective credits	3 – 6
Professional experience	3 - 6

The purpose of the SEM-PSE program option 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 SEM – PSE

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

3.1.4 Wood Science

The department administers an M.P.S. degree 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.

This program deals with the fundamental properties of wood as a material, wood products manufacturing (drying, machining, preservative treatments) and the properties and performance of manufactured wood products. Coursework provides students in-depth analysis of properties such as mechanical, dimensional stability, durability against microorganisms, wood cell wall ultrastructure and others. Courses concerned with this subject are central to a student's program, extended and enriched with selected courses in microscopy, sustainable construction, applied mathematics, and computer applications. Supporting this work is the MaterialsTesting Lab in Baker, a Wood Moisture lab with dry kiln, electron microscopes, the H.P. Brown Memorial wood collection with more than 10,000 archived wood samples. the wood biodegradation lab and supporting equipment.

Table 10. MPS – WS 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 wood science as applied to manufactured wood products and processes. Students can expect to be trained broadly in the skills, science and engineering of the manufacturing processes and performance of lumber, composite products, engineered wood products, and related products. This is in contrast to the Master of Science degree which is a more intensive course of study into the fundamental properties and manufacturing processes.

Table 11. Sample Curriculum for MPS – WS

Courses	**Courses**	**Core Course**	**Credit Hours**	**Semester**
RMS 587	Renewable Materials for Sustainable Construction	•	3	Fall-Semester 1
CME 686	Wood-Water Relationship	•	3	Fall-Semester 1
	Elective		3	Fall-Semester 1
			--	Fall-Semester 1
RMS 200	Composite Materials for Sustainable Construction	•	3	Spring-Semester 2
	Core course	•	3	Spring-Semester 2
	Elective Statistics ??		3	Spring-Semester 2
RMS 898	Professional Synthesis		3	Summer
	Elective		3	Fall-Semester 3
	Elective		3	Fall-Semester 3
	Elective		3	Fall-Semester 3

3.1.5 Elective Courses for MPS Programs

3.1.5.1 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)

3.1.5.2 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)

3.1.5.3 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

3.1.5.4 Wood Science

RMS 587 Renewable Materials for Sustainable Construction (3)
RMS 596 Special Topics in Renewable Materials Science (1 - 3)
RMS 622 Composite Materials for Sustainable Construction (3)
CME 686 Wood-Water Relationships (3)
CME 770 Biodegradation of Wood (3)
MCR 580 Microtechnique of Wood (3)
MCR 585 Light Microscopy for Research Applications (3)
MCR 680 Fundamentals of Microscopy (3)
MCR 683 Operation of the Transmission Electron Microscope (3)
MCR 783 Operation of the Scanning Electron Microscope (3)
RMS 796 Advanced Topics in Renewable Materials Science (1 - 3)
RMS 898 Professional Experience in Renewable Materials Science (1 - 6)
CME 504 Environmental Performance Measures for Building (3)
CME 505 Sustainable Energy Systems for Buildings (3)
CME 525 Construction Methods and Equipment (3)
CME 543 Construction Estimating (3)
CME 565 Sustainable Innovations in Residential Construction (3)
CME 653 Construction Planning and Scheduling (3)
CME 654 Construction Project Management (3)
CME 658 Construction Contracts and Specifications (3)

3.1.5.5 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)

3.1.5.6 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.

3.1.5 Elective Courses for MPS Programs

3.1.6.1 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

3.1.6.2 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

3.1.6.3 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

3.1.6.4 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

3.1.6.5 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

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

Four programs are available:

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

3.2.1 Biomaterials Engineering (BME)

The BME program offers areas of study in:

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

3.2.1.1 Bio composite Materials, Biopolymers

- Paper, cellulosic and natural fibrous materials
- Natural rolled erosion control products
- Bacterial cellulose and polyesters
- Wood, lignocellulosic-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.

3.2.1.2 Bioactive Materials and Biosensors

- Bioactive paper, cellulosic and natural fibrous materials
- E-paper
- Photosensitive polymers, fibers and materials
- Antimicrobial coatings, fibrous and non-woven 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.

3.2.1.3 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.

3.2.2 Bioprocess Engineering (BPE)

Projects conducted in the department under this program develop fundamental knowledge of bioprocess engineering with applications in biopharmaceuticals, wastewater, and biorefinery processes.

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

The MS BPE 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

3.2.2.1 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.

3.2.2.2 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.

3.2.2.3 Bioprocess Design, Simulation and Control

- Process desing
- 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.

3.2.2.4 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.

3.2.2.5 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.

3.2.2.6 Biopharmaceuticals

- 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.

3.2.3 Paper Science and Engineering (PSE)

The MS & PhD PSE program offers areas of study in:

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

3.2.3.1 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.

3.2.3.2 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.

3.2.3.3 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.

3.2.3.4 Process and Environmental Systems Engineering

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

3.2.4 Wood Science (WS)

The MS & PhD WS program offers areas of study in:

- Engineered Wood Products and Structures (Timber structure design)

- Tropical Timbers
- Wood Anatomy and Ultrastructure
- Wood Science and Technology
- Wood Treatments

3.2.4.1 Engineered Wood Products and Structures (timber structure design

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

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. 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

3.2.4.2 Tropical Timbers

Topics of study may include:

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

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.

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.

3.2.4.3 Wood Anatomy and Ultrastructure

Topics of study include:

- Wood formation and cell wall organization
- Cytoskeleton of plant cells
- Properties related to anatomy and ultrastructure
- Electron and light microscopy

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.

3.2.4.4 Wood Science and Technology

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

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.

3.2.4.4 Wood Treatments

Topics of study include

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

Graduate study in the area of wood treatments allows the student to investigate the 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.

3.3 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. 500 level course are not accepted except 596 courses which of advanced topics in nature. Students may obtain credit for equivalent courses taken elsewhere upon approval of the steering committee and appropriate petition procedures.

3.3.1 BPE Program

MS Program

Semester 1

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

Semester 2

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

Semester 3

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

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

Semester 4

Course	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

Course	Course Number	Credits
Chemical Engineering Thermodynamics	CEN 656	3
Thesis Research	BPE 999	9

Semester 6

Course	Course Number	Credits
Thesis Research	BPE 999	12

Semester 7

Course	Course Number	Credits
Thesis Research	BPE 999	6
Capstone Seminar	BPE 797	1

3.3.2 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 on 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 field 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)

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

BPE 899 Master's 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 permission 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.

3.3.3 PSE Program

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. 500 level course are not accepted except 596 courses which of advanced topics in nature. Students may obtain credit for equivalent courses taken elsewhere upon approval of the steering committee and appropriate petition procedures.

MS Program

Semester 1

Course	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

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

Semester 3

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

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

Semester 4

Course	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

Course	Course Number	Credits
Chemical Engineering Thermodynamics	CEN 656	3
Thesis Research	PSE 999	9

Semester 6

Course	Course Number	Credits
Thesis Research	PSE 999	12

Semester 7

Course	Course Number	Credits
Thesis Research	PSE 999	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.

3.3.4 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 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 – Bio renewable 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 microscope 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.

3.3.5 Wood Science Program

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. 500 level course are not accepted except 596 courses which of advanced topics in nature. Students may obtain credit for equivalent courses taken elsewhere upon approval of the steering committee and appropriate petition procedures.

MS Program

Semester 1

Course	Course Number	Credit
		3
		3
		3
Thesis Research	RMS 899	3

Semester 2

Course	Course Number	Credit
		3
		3
		3
Thesis Research	RMS 899	3

Semester 3

Course	Course Number	Credit
Prof and Tech Writing	EWP 605	3
Thesis Research	RMS 899	3
Capstone Seminar	RMS 797	1

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

Semester 4

Course	Course Number	Credit
		3
		3
		3
Thesis Research	RMS 999	3

Semester 5

Course	Course Number	Credit
		3
Thesis Research	RMS 999	9

Semester 6

Course	Course Number	Credit
Thesis Research	RMS 999	12

Semester 7

Course	Course Number	Credit
Thesis Research	RMS 999	6
Capstone Seminar	RMS 797	1

3.3.6 Suggested courses in the Wood Science Program

RMS 587 - Renewable Materials for Sustainable Construction (3)

Three hours of discussion, lecture and demonstration per week. Properties and uses of wood and other renewable materials as major construction materials. Identification and knowledge of the major wood species and their applications in construction. Evaluation of current practices and materials. Fall.

RMS 596 - Special Topics in Renewable Materials Science (1 – 3)

Lectures, conferences, discussions and laboratory. Topics in Renewable Materials Science not covered in established courses. Designed for the beginning graduate student or selected upper-division undergraduate. Fall and/or Spring.

RMS 688 - Composite Materials for Sustainable Construction (3)

Two hours of lecture, three hours of laboratory per week. Properties, manufacture, and design of multiphase materials. Applications and testing for service in sustainable construction systems and life-cycle analysis. Evaluation of current practices and materials. Spring. Prerequisite(s): GNE 271, Statics, and RMS 387 or RMS 587, Renewable Materials for Sustainable Construction

CME 686 – Wood Water Relationships (3)

Two hours of lecture and three hours of laboratory per week. Relationship between wood moisture content and the environment, electrical and thermal properties, theories of moisture sorption, hygroscopic swelling and shrinking, thermodynamics of moisture sorption, mechanism of moisture movement as it relates to activation theory. Laboratory exercises will complement the theoretical topics discussed in the lecture. Fall.
Prerequisite: Permission of instructor.

CME 770 – Biodegradation of Wood (3)

Two hours of lecture and 1 hour of laboratory/demonstration/discussion per week. Biology of lignicolous fungi and other microorganisms concerning their effects on wood properties. Anatomical, biological and chemical aspects of the major types of wood decay. Spring.
Prerequisite: Introductory biology and permission of instructor.

MCR 580 – Micro technique of Wood (3)

Two hours of lecture and 1 hour of laboratory/demonstration/discussion per week. Biology of lignicolous fungi and other microorganisms concerning their effects on wood properties. Anatomical, biological and chemical aspects of the major types of wood decay. Spring.
Prerequisite: Introductory biology and permission of instructor.

MCR 585 – Light Microscopy for Research Applications (3)

Two hours of lecture/three hours of laboratory per week. Principles of light microscopy and photomicrographic digital imagery using Spot camera and Image Pro 7.0 software. Extensive laboratory component. Spring
Prerequisite: Permission of instructor

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 683 – Operation of the Transmission Electron Microscope (3)

Two hours of lecture/ 3 hours of demonstration/laboratory per week. Theory and operation of the transmission electron microscope, including specimen preparation, digital imaging, and interpretation of micrographs.

MCR 783 – Operation of the Scanning Electron (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.

RMS 796 – Advanced Topics in Renewable Materials Science (1 – 3)

Lectures, conferences, discussions and/or laboratory. Advanced topics in renewable materials science. Fall and/or Spring. Prerequisite: Permission of instructor

Prerequisite: Permission of instructor

RMS 798 – Research in Renewable Materials Science (1 – 12)

Independent research topics in renewable materials science. Fall, Spring or Summer. Credit hours to be arranged.

RMS 898 – Professional Experience in Renewable Materials Science (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.

Pre- or co-requisite(s): Approval of proposed study plan by advisor, Faculty, and any sponsoring organization.

RMS 899 – Master's Thesis Research in Renewable Materials Science (1 – 12)

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

RMS 999 – Doctoral Thesis Research in Renewable Materials Science (1 -12)

Research and independent study for the doctoral dissertation. Fall, Spring or Summer. Credit hours to be arranged.

CME 504 – Environmental Performance Measures for Building (3)

Three hours of lecture per week. Environmental Performance Measures for Buildings - Three hours of lecture/discussion per week. Overview of building rating systems for green construction, their development, present application, and future directions for growth. Explores the process for development of individual standards, different building certification systems that have been developed using these standards, and long-term development and code adoption of such certification systems. An experiment-based, analytical, or evaluative project is required. Fall

Prerequisite(s): Graduate standing, or upper division standing with approval of instructor. Note: Credit will not be given for both CME 304 and CME 504.

CME 505 – Sustainable Energy Systems for Buildings (3)

Three hours of lecture/discussion per week. Exploration of construction management-related issues in creating a more sustainable energy use in our building stock. Integrating sustainable energy sources in construction as well as issues related to using energy more efficiently. An experiment-based, analytical, or evaluative project is required. Fall

Prerequisite(s): Graduate standing, or upper division standing with approval of instructor. Note: Credit will not be given for both CME 305 and CME 505.

CME 525 – Construction Methods and Equipment (3)

Three hours of lecture/discussion per week. Analysis of heavy construction operations and related environmental concerns. Production calculations, means and methods selection and operating costs of heavy construction equipment are addressed. The economics of equipment use are analyzed. The use of a digitizer in earthwork quantity takeoff is explored. The outcome of the course is to select the most cost efficient and performance efficient method and equipment. A term paper is required. Spring.

Note: Credit will not be granted for both CME 525 and CME 350.

CME 543 – Construction Estimating (3)

Three hours of lecture/discussion per week. Definition and explanation of estimating/bidding theory and process. The processes for reviewing and interpreting contracts, specifications and blueprints as well as their role in the estimating/bidding process. Perform a quantity takeoff. Create a final estimate/bid, including the appropriate General Conditions and Markups. Several projects based on the concepts listed above as well as utilizing either a spreadsheet or Timberline Precision Estimating. A term paper describing how the relevant topics of the course fit a specific industry application, and production of an additional project based on Timberline Precision estimating software or equivalent are required. Spring.

Prerequisites: CME 255 Plan Interpretation and QTO or basic estimating experience and permission of the instructor. Note: Credit will not be granted for both CME 543 and CME 343.

CME 565 – Sustainable Innovations in Residential Construction (3)

Three hours of lecture per week. Principles of sustainable residential construction; the adaptation of biological, ecological, and cultural elements into building performance standards, practical building specifications, standards, and systems. Spring.

CME 643 – Estimating for Construction in a Green Global Economy (3)

Three hours of lecture per week. Building upon the estimating skills developed through undergraduate coursework and professional experience this course will look at how to address global estimating concerns such as monetary value between various currencies, how the purchase of commodities futures effects material pricing, the linkages between financial, real estate development and policies and their effects on the construction markets. How to price multi-year projects addressing the previous issues and how to construct an estimate that will convey the information relative to green construction costs to the client in a proper manner will also be addressed. Fall or Spring.

Prerequisites: CME 543 or equivalent or 3 to 5 years of professional estimating experience and permission of instructor.

CME 653 – Construction Planning and Scheduling (3)

Three hours of lecture/discussion per week. The use of Gantt, Activity on Node, Precedence Diagram, PERT and Linear schedules. Identification of activities and duration analyses of these

activities. Update schedules, plan and assign resources, plan cost and schedule. Schedule development is performed both manually and with industry accepted software. A term paper describing how the relevant topics of the course fit a specific industry application and an additional project utilizing the software are required. Fall.

Prerequisites: Estimating experience and/or equivalent scheduling experience. Note: Credit will not be granted for both CME 653 and CME 453.

CME 654 – Construction Project Management (3)

Three hours of lecture/discussion per week. How to define and properly identify company organizational structures. Project delivery systems, integration of estimating, bidding, scheduling and cost control into the management process. How safety, quality control, value engineering, procurement, labor relations and insurance and bonding requirements are integral parts of a construction project. A term paper describing how the relevant topics of the course fit a specific industry application is required. Spring.

Prerequisite(s): CME 543, CME 653, or equivalent experience and permission of the instructor. Note: Credit will not be granted for both CME 654 and CME 454.

CME 658 – Construction Contracts and Specifications (3)

Three hours of lecture/discussion per week. The types of construction contracts used in the construction industry from the Owner, Contractor, Subcontractor and Supplier viewpoints. Types of required insurance and the remedies available to contractors are presented. The process of bidding and negotiating from the legal perspective is covered along with contract administration. Specifications are introduced by type and the requirements of each type are discussed, based on current industry-accepted standards. A term paper describing how the relevant topics of the course fit a specific industry application is required. Spring.

Prerequisite: Upper division standing or permission of instructor. Note: Credit will not be granted for both CME 658 and CME 455.

4.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.

4.1 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 12. Suggested Courses for Advanced Certificate in Bioprocessing

Course	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

4.2 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 - Introduction to Polymer Coatings (3)

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.

BPE 536 – Radiation Curing of Polymer Technologies (3)

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.

BPE 511 – Radiation Curing Equipment, Instrumentation and Safety (3)

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.

5. 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.

6. 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 integrate an overseas experience into their graduate program, please consult your major professor first before making any plans.

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

7. 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.

8. 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.

8.1 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.
- 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 lose, 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 always mandatory 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.

9. Academic Advising

A primary goal of the Department of Paper and Bioprocess Engineering is to ensure that all our students' progress through the academic programs in its intended course sequence while meeting all prerequisite requirements. Academic advising is the principal 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.

10. Selection of Advisor and Committee

All graduate students who come to PBE have a temporary major professor appointed. It is the student's responsibility to communicate with the department faculty to find their thesis advisor (major professor) who is willing, can accommodate and can best serve them. This should be the first task after you have arrived on ESF campus. Form 2A is the form you will need for your major professor appointment.

As mentioned in the previous section, section 9, you should discuss your course selection with your advisor to best plan your area of research while enriching your career / experience. Having some input from your major professor is highly recommended.

Form 2A is more than major professor appointment. While you are interviewing the PBE faculty, you should have the advisory committee in mind too. Do work with your intended major professor to fill in the advisory committee.

11. 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.

12. Graduate Assistantships

There are various sources of scholarships and assistantships available for graduate students. Table 13 shows some of the options available. To be eligible for teaching assistantships (to assist courses in the Department of Paper and Bioprocess Engineering), you must submit an application outlining your willingness and ability to assist the specific courses, and your research progress / achievements.

Table 13. Graduate Student Support

Type of Support	Eligibility	More Information (Contact)
State Graduate Assistantships (Teaching Assistants in PBE)	MS, PhD	Bandaru V. Ramarao, bvramara@esf.edu
Joachim Assistantships	MPS	Gary M. Scott, gscott@esf.edu
Joachim Fellowships	MS, PhD	Gary M. Scott, gscott@esf.edu
State Graduate Assistantships (Teaching Assistants in Chemistry)	MPS, MS, PhD	Department of Chemistry
SPPF Scholarships	MPS	http://www.esf.edu/pbe/sppf/scholarships.htm, (Debbie DeWitt, dkdewitt@esf.edu)
Research Project Assistantships	MS, PhD	Contact individual faculty members
Outreach GA Positions	MPS, MS, PhD	Outreach (outreach@esf.edu)
NSF Graduate Research Fellowships	MS, PhD	NSF website

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 2019-2020

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 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 9, Monday
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

Fall 2020

Classes begin	August 31, Monday
Labor Day (no classes)	September 7, Monday
Last day to add a class	September 8, Tuesday
Last day to drop a class	September 25, Friday
Advising for Spring 2021	October 26-November 3, Monday-Tuesday
Last day to withdraw from a class with a grade of W	October 30, Friday
Registration for Spring 2021	November 4-December 11, Wednesday-Friday
Thanksgiving recess	November 22-29, Sunday-Sunday
Last day to withdraw from a class with a grade of W or WF	December 4, Friday
Last day of classes	December 11, Friday
December Commencement	December 11, Friday
Reading days	December 12-13, Saturday-Sunday
Final Exams	December 14-16, Monday-Wednesday
Reading day	December 15, Tuesday
Reading day (am)	December 17, Thursday
Final Exams PM	December 17, Thursday
Final Exams	December 18, Friday
Grades due	December 24, Thursday

Spring 2021

Martin Luther King Day - no classes	January 18, Monday
Classes begin	January 19, Tuesday
Last day to add a class	January 26, Tuesday
Last day to drop a class	February 12, Friday
Spring break	March 14-21, Sunday-Sunday
Last day to withdraw from a class with a grade of W	March 23, Tuesday
Advising for Fall 2021	March 31-April 6, Wednesday-Tuesday
Registration for Fall 2021	April 7-27, Wednesday-Tuesday
Last day to withdraw from a class with a grade of W or WF	April 23, Friday
Last day of classes	April 27, Tuesday
Reading day	April 28, Wednesday
Final Exams	April 29-30, Thursday-Friday

Reading days	May 1-2, Saturday-Sunday
Final Exams	May 3-5, Monday-Wednesday
ESF May Commencement	May 8, Saturday
ESF/SU Joint May Commencement	May 9, Sunday
Grades due	May 12, Wednesday

Fall 2021

Classes begin	August 30, Monday
Labor Day (no classes)	September 6, Monday
Last day to add a class	September 7, Tuesday
Last day to drop a class	September 24, Friday
Advising for Spring 2022	October 25-November 2, Monday-Tuesday
Last day to withdraw from a class with a grade of W	October 29, Friday
Registration for Spring 2022	November 3-December 10, Wednesday-Friday
Thanksgiving Recess	November 21-28, Sunday-Sunday
Last day to withdraw from a class with a grade of W or WF	December 3, Friday
Last day of classes	December 10, Friday
December Commencement	December 10, Friday
Reading days	December 11-12, Saturday-Sunday
Final Exams	December 13-15, Monday-Wednesday
Reading day	December 14, Tuesday
Reading day (am)	December 16, Thursday
Final Exams PM	December 16, Thursday
Final Exams	December 17, Friday
Grades due	December 24, Friday

Spring 2022

Martin Luther King Day - no classes	January 17, Monday
Classes begin	January 18, Tuesday
Last day to add a class	January 25, Tuesday
Last day to drop a class	February 11, Friday
Spring break	March 13-20, Sunday-Sunday
Last day to withdraw from a class with a grade of W	March 22, Tuesday
Advising for Fall 2022	March 30-April 5, Wednesday-Tuesday
Registration for Fall 2022	April 6-26, Wednesday-Tuesday
Last day to withdraw from a class with a grade of W or WF	April 22, Friday

Last day of classes	April 26, Tuesday
Reading day	April 27, Wednesday
Final Exams	April 28-29, Thursday-Friday
Reading days	April 30-May 1, Saturday-Sunday
Final Exams	May 2-4, Monday-Wednesday
ESF May Commencement	May 7, Saturday
ESF/SU Joint May Commencement	May 8, Sunday
Grades due	May 11, Wednesday

Appendix B. PBE Faculty and Staff

Faculty Member

Faculty Member	Office	Phone	Email
Dr. Bandaru V. Ramarao *Interim Chair* *Professor*	205 Walters	470-6513	bvramara@syr.edu
Dr. Biljana Bujanovic *Associate Chair* *Associate Professor*	419 Walters	470-6907	bbujanovic@esf.edu
Dr. Susan Anagnost *Professor and Director, NC Brown Center /Ultrastruct. Studies*	211 Baker	470-6837	seanagno@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
Dr. Deepak Kumar *Assistant Professor*	Walters	470-	
Dr. Shijie Liu *Professor, Graduate Coordinator*	302 Walters	470-6885	sliu@esf.edu
Dr. Robert Meyer *Professor , Undergraduate Coordinator*	222 Baker	470-6838	rwmeyer@esf.edu
Dr. Gary M Scott *Professor*	321 Walters	470-6523	gscott@esf.edu
Dr. William Smith *Professor and Director, Wood Utilization Service*	218 Baker	470-6832	wbsmith@esf.edu
Dr. Chang Geun Yoo *Assistant Professor*	409 Walters	470-6516	cyoo05@syr.edu

Lectures and Adjunct Professors

Lectures and Adjunct Professors	Office	Phone	Email
Mr. William Burry *Lecturer*	307 Walters	470-4779	wmburry@esf.edu
Mr. Sergiy Lavrykov *Adjunct*	412 Walters	470-	Lavrykov@esf.edu
Mr. Thomas Heenan *Adjunct*	306 Walters	470-6520	twheenan@esf.edu

Emeritus Faculty

Emeritus Faculty	Office	Phone	Email
Dr. Thomas E. Amidon			teamidon@esf.edu
Dr. Yuan-Zong Lai			yzlai@syr.edu

Staff Member

Staff Member	Office	Phone	Email
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: enter student name Date: enter date

Department: enter department name

Area of Study: 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 #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	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 #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	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 #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.

Course #	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 #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	Enter course title	Cr.hrs.
Course #	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

2. Library usage ☐ Requirement completed Target semester for completing course

C. Master's Study Integration

Target date for capstone seminar: enter semester

D. Degree completion

Target semester for completion: 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

Form 3B (MS)

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: enter student name Date: enter date

Department: enter department name

Area of Study: 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#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	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#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	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#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	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#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	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#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	Enter course title	Cr.hrs.
Course#	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 — Target Semester for Completion:

1. Technical Writing ☐ complete _____

2. Library Usage ☐ complete _____

C. Preliminary examination

Target semester for proposal: _____

D. Research tool(s)

Tool Click here to enter tool Target semester for completion: Click here to enter semester
Tool Click here to enter tool Target semester for completion: Click here to enter semester

E. Candidacy examination

Target semester for completion: 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

_____ 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: 3.8.2010

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

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

Thesis Proposal Approval Form

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: enter 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: Click or tap to enter a 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: _____

Full-Time Status Form

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)

Extension of Time Limit for Degree Completion

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

Petition Form

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