Department of
Paper and Bioprocess Engineering

Student Handbook Supplement

Bioprocess Engineering
Paper Engineering
Renewable Materials Science

State University of New York

College of Environmental Science and Forestry

September, 2018

Revision History

V18.00	July 11, 2018	Added RMS program, made numerous edits to text
V17.00	August 5, 2015	Revised and BPE programs updated
V16.00	August 14 2014	Revised
V15.00	May 1, 2014	Revised
V14.00	May 1, 2013	ABET accreditation information updated.
V13.00	May 1, 2012	Revised.
V12.00	May 1, 2011	Updated Paper Engineering and Bioprocess Engineering programs. Double-up in some areas of GenEd courses lead to effective reduction of GenEd courses requirements.
V11.00	August 1, 2010	SPPF Scholarship updated.
V10.00	May 1, 2009	Updated Paper Programs and added Dual degree programs.
V9.00	July 1, 2008	Revised BPE program, concentrations with elective courses suggested. All GenEd courses (more relevant to the PBE programs) are suggested.
V8:00	May 1, 2007	BPE curriculum supplemented with electives, study abroad/international experience, revision of documentation. Dr. Shijie Liu
V7.00	30 August 2006	Revised curriculum, PSC option sheets, directory
V6.00	6 July 2005	Revised schedule, directory, safety, and ethics
V5.00	13 October 2004	Revised schedule, directory, new programs, educational objectives and outcomes
V4.00	9 September 2003	Revised schedule, directory, ABET information, email information, FE exam information
V3.00	22 August 2002	Revised schedule, directory
V2.01	22 August 2001	Revised GenEd, Directory
V2.00	01 May 2001	Annual revision, updated curriculum
V1.00	23 August 2000	Revised
V0.04	14 July 2000	Revised
V0.03	18 May 2000	Revised General Education Section
V0.02	10 May 2000	Revised
V0.01	19 August 1999	First Draft Edition, Dr. Gary Scott

Table of Contents

Introduction to the Student Handbook

This handbook provides important information concerning the policies, regulations, and practices of the Department of Paper and Bioprocess Engineering at the State University of New York, College of Environmental Science and Forestry. It also contains additional information for students regarding advising, registration, petitions, summer mill experiences, co-op positions, and on-campus interviewing.

It is important to remember that the official requirements for the B.S. degree 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. These official requirements are the requirements that must be met in order to graduate, and constitute a contract between the student and the college. Changes to degree requirements can be made by submitting a petition from the student to the college via the student's advisor and the department chair. This handbook serves to clarify some of the items in the catalog and gives the student additional information regarding the curriculum and the Department.

This handbook is a work in progress and is expected to improve in the following years. It contains information accumulated from Prof. G.M. Scott beginning in 1999. Since this is a student handbook, student feedback is very important and will be collected throughout the year. Suggestions for improvements can be sent directly to the Department of Paper and Bioprocess Engineering's undergraduate coordinator at rwmeyer@esf.edu.

Mission, Program Objectives, and Program Learning Outcomes

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

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

To accomplish the educational aspects of this mission, the Department currently offers three programs of study, each with their own objectives and learning outcomes. These programs of study are detailed in the following sections.

Undergraduate Programs of Study

The college pioneered instruction for the pulp and paper industry in 1920 with the formation of a paper science and engineering faculty and has maintained a leading position in this area of professional education since then. The paper science and engineering program was very successful, which led to the expansion into two separate programs: Paper Science and Paper Engineering, to accommodate the industrial needs and student population.

Since 2002, the Department's pioneering efforts have led to new technologies in the biorefinery, biochemical, and bioprocess areas. The expansion in research beyond pulp and paper applications led to the creation of the Bioprocess Engineering program in 2006. The Bioprocess Engineering program was the first of its kind in the country. The Bioprocess Engineering program utilizes chemical engineering principles combined with biological concepts to create biologically-based materials.

In 2017, extensive revisions were made to the Paper Science program to incorporate elements from the wood science program that existed in the college since its foundation in 1911, as well as the addition of an option in Polymer Science. The revised program was named Renewable Materials Science to recognize the scientific study and production of materials that are renewable by nature and are therefore available on a sustainable basis.

The paper engineering, bioprocess engineering, and renewable materials science programs provide a broad base of study in the fields of wood, paper and bio-based products to prepare men and women for professional positions in the pulp, paper, wood, bioconversion, chemical and other industries. The paper packaging, paper products, and

forest and wood products industries combined are the third largest sector of the basic materials industries in the United States. .

The PBE programs have a long-standing reputation for preparing graduates for rewarding positions as research chemists, process engineers, technical service representatives, managers, and many others careers. Graduates have advanced to positions of leadership in research, management, technical operations, and sales in the bioprocessing and pulp and paper industry as well as allied industries of heavy equipment manufacture, process chemicals, and other bio-based industries. Other graduates have gone on to successful careers in the medical, chemical, and other varied fields.

The bioprocess engineering and paper engineering programs provide education in the physical sciences and chemical engineering, with specific emphasis on those aspects that relate to the sustainable manufacture of pulp and paper and other products from wood and other lignocellulosic materials. This includes the chemistry, anatomy, and components of wood, the conversion of wood to pulp, paper, and other products, and the chemistry and physics of paper and paper formation. The engineering programs include the basics of chemical engineering with a foundation of unit operations and specialized courses such as air and water pollution abatement from an industrial perspective. The paper engineering program extends this foundation to present a chemical engineering education tailored specifically to the pulp and paper industry. The bioprocess engineering programs extends a chemical engineering education with a focus on biomass feedstocks and biological processes rather than a focus on the nonrenewable petroleum and fossil energy resources. The industry now uses advanced chemistry and biotechnology to improve utilization of renewable carbon and hydrogen in lignocellulosics.

The renewable materials science program takes a more science-based (e.g., chemistry, biology and materials science) approach to the study of paper, wood, and bio-based polymer systems. With the science approach, students are able to more deeply explore particular aspects of bio-based materials. Similar lower division curricula amongst all three programs allow students to switch programs with minimal disruption. The polymer science option includes detailed instruction in chemical analysis of materials.

The paper engineering program has been accredited by the Engineering Accreditation Commission/Accreditation Board for Engineering and Technology (EAC/ABET) since 2002. The bioprocess engineering program was accredited by the Engineering Accreditation Commission/Accreditation Board for Engineering and Technology (EAC/ABET) in 2012.

Students need to decide the program that they will be pursuing as soon as they enter the college. However, the two engineering programs are similar for the first two years, allowing easy transfer between these programs. The decision to pursue a management minor also needs to be decided by this time. All programs are excellent preparation for graduate study.

Table 1 summarizes the programs in terms of the required and elective courses. Internships are required for Bioprocess Engineering and Paper Engineering.

Table 1. Summary of required and elective courses for Bachelor of Science Programs in the Department of Paper and Bioprocess Engineering.

The number of credit hours for each required class is listed in the appropriate column. Categories of electives are listed as *be* for Biology/Biochemistry/Biotechnology; *ce* for Chemistry; se for science; and *ee* for engineering.

Course Title	**Course Number**	**BPE**	**PEN**	**RMS**		
				Paper	Polymer	Wood
Computing Methods	GNE 160	3	3	3	3	3
Calculus I	APM 205	4	4	4	4	4
Calculus II	APM 206	4	4	4	4	4
Calculus III	APM 307	4	4			
Differential Equations	APM 485	3	3			
Introduction to Probability and Statistics	APM 391			3	3	3
Probability and Statistics for Engineers	APM 395	3	3			
	Σ	21	21	14	14	14
Basic Sciences						
General Biology II: Cell Biology and Genetics	EFB 103/104	4				
Dendrology	EFB 336			3		3
General Chemistry I	FCH 150 & 151	4	4	4	4	4
General Chemistry II	FCH 152 & 153	4	4	4	4	4
Organic Chemistry I	FCH 221 & 222	4	4	4	4	4
Organic Chemistry II **or** Introduction to Lignocellulosics	FCH 223 & 224 **or** PSE 223	4	4	4	4	4
Physical Chemistry I	FCH 360	3	3	3	3	3
Engineering Thermodynamics	PSE 361	*ce*	3	3	3	3
Analytical Chemistry I	FCH 380	*ce*	*se*		3	
Analytical Chemistry II	FCH 381				3	
Spectroscopic ID of Organic Compounds	FCH 384				4	
Undergraduate Seminar	FCH 497				1	
Introduction to Research	FCH 498				1-5	
Polymer Science: Synthesis and Mechanisms	FCH 550				3	
Polymer Techniques	FCH 551				3	
Polymer Science: Properties and Technology	FCH552				3	
General Physics I	PHY 211 & 221	4	4	4	4	4
General Physics II	PHY 212 & 222	4	4	4	4	4
	Σ	31	30	33	51	33
General Education other than natural sciences listed above (http://www.esf.edu/registrar/gened.asp)						
Writing and the Environment	EWP 190 (S or F)	3	3	3	3	3
Writing, Humanities and the Environment	EWP 290 (S or F)	3	3	3	3	3
Introduction to Economics	FOR 207 (S or F)	3	3	3	3	3
The Arts (PSE 201 is required for PEN and RMS. BPE must select an elective)	PSE 201 (Fall)		3	3	3	3
BPE, PEN, and RMS must select one elective from one of the four following categories: American History (select one elective) Western Civilization (select one elective) Other World Civilizations (select one elective) Foreign Language (select one elective)		6	3	3	3	3
The registrar's website (http://www.esf.edu/registrar/gened.asp has lists of ESF courses that meet general education requirements						
	Σ	15	15	15	15	15

Professional Education						
Writing for Env. & Science Professionals	EWP 407	*ee*	*ee*			
Professional Writing/Paper & Bioprocess Engineering.	EWP 444	2	2	2	2	2
Information Literacy	ESF 200 (PBE session)	1	1	1	1	1
Undergraduate Seminar	FCH 497				1	
Polymer Science: Synthesis & Mech.	FCH 550				3	
Polymer Techniques	FCH 551				3	
Polymer Science	FCH 552				3	
Professional Engineering Skills seminars	GNE 330	3	3			
Management in Industry	PSE 456			3	3	3
Product Design	RMS 468			3		3
Capstone Project	RMS 481			3		3
Fundamentals of Microscopy	MCR 480		*ee*		3	e
Microtechnique of Wood	MCR 580					e
Wood Chemistry and Physics	CME 487	*ee*	*ee*			
Fiber Identification Laboratory	CME 388	*ee*	*ee*			
Building Code of New York State	CME 330					3
Materials Marketing	CME 444					3
	Σ	6	6	12	19	18
Engineering/Engineering Science Courses						
Colloid & Interface Science	BPE 310	3		3	3	3
Transport Phenomena	BPE 335	3	3			
Bioseparations	BPE 420	3				
Bioprocess Kinetics and Systems Engineering	BPE 421	3				
Unit Process Operation Laboratory	BPE 430	3	3			
Unit Process Operations	BPE 435	3	3	e		
Introduction to Biorefinery Orocesses	BPE 438	*ee*				
Bioprocess and Systems Laboratory	BPE 440	3				
Bioprocess Engineering Design	BPE 481	3				
Bioprocess Engineering Research Problems	BPE 498	*ee*	*ee*			
Electrical Engineering Fundamentals I	ELE 231	*ee*	*ee*			
Statics	GNE 271			3	3	3
Statics and Dynamics	GNE 172	*ee*	*ee*			
Mechanics of Materials	GNE 273	*ee*	*ee*	3	3	3
Water Pollution Engineering	ERE 440	*ee*	*ee*			
Physical Chemistry II	FCH 361				3	
Air Pollution Engineering	GNE 461	*ee*	ee			
Fiber Processing	PSE 350		3			
Engineering Thermodynamics	PSE 361	3	3	3		3
Principles of Mass and Energy Balances	PSE 370	3	3	3		
Fluid Mechanics	PSE 371	3	3	e		
Pulp and Paper Unit Operations	PSE 436	3	*ee*			
Biorenewable Fibroous and Nonfibrous Products	PSE 438			e	e	3
Fiber and Paper Properties	PSE465		3			
Papermaking Processes	PSE 468	*ee*	3			
Process Control	PSE 477	3	3	e		
Engineering Design Economics	PSE 480	3	3	e		
Engineering Design	PSE 481		3	e		
Research Problem	PSE 498		*ee*			
Solid Waste Management	ERE 468	*ee*	*ee*			
Transport Properties of Materials	RMS 335			3		3
Renewable Materials for Sustainable Construction	RMS 387			3	3	3
Wood and Fiber Identification Laboratory	RMS 388			2	2	2
Composite Materials for Sustainable Construction	RMS 422			3	3	3
Renewable Materials and Surfaces: Testing	RMS 465			3	3	3
Product Design: Timber or Paper	RMS 468			3		3
Capstone Project/Senior Thesis	RMS 481			3		3
	Σ	42	36	35	23	35
Applied Science/Engineering Courses						
Introduction to Process Engineering I	BPE 132	1				
Introduction to Process Engineering II	BPE 133	1				

Introduction to Process Engineering I	PSE 132		1			
Introduction to Industrial Bioprocessing	BPE 300	3				
Introduction to Process Engineering II	PSE 133		1			
Introduction to Renewable Materials Science I	RMS 132			1	1	1
Introduction to Renewable Materials Science II	RMS 133			1	1	1
Introduction to Papermaking	PSE 200	*ee*				
Pulp and Paper Laboratory Skills	PSE 202	ee	1			
Renewable Materials and Composites	RMS 200			3	3	3
Wood Machining	RMS 322					3
Colloid and Interface Science	BPE 310	3		3	3	3
Summer Internship Experience	BPE 304	2				
Summer Mill Experience	PSE 304		2			
Fiber Processing	PSE 350	ce, ee	3			
Applied Structures	CME 404					e
Bioseparations	BPE 420	3				
Equipment Troubleshooting & Maintenance	PSE 437	ee	ee			
Biorenewable fibrous and nonfibrous products	PSE 438	ee	ee			
Pulping and Bleaching	PSE 450	ce	ee			
Fiber and Paper Properties	PSE 465		3			
Paper Pigment and Barrier Coating	PSE 466		se			
Papermaking Wet End Chemistry	PSE 467		se			
Functional and Nano Additives	PSE 469		ee			
Research Practice	PSE 492	ee	ee			
Fiber materials recycling and processes	PSE 552		ee			
Wood Chemistry	FCH 571	ce				
Carbohydrates I: structure, reactions and analysis	FCH 540	ce				
Topics in natural products chemistry	FCH 524	ce				
Polymer Science: synthesis and mechanisms	FCH 550	ce				
Polymer techniques	FCH 551	ce				
Polymer Science: properties and technology	FCH 552	ce				
Environmental Chemistry I	FCH 510	ce				
Environmental Chemistry II	FCH 511	ce				
Methods of Environmental Chemical Analysis	FCH 515	ce				
Σ		13	11	8	8	11
Biology/Biotechnology Courses						
Introduction to environmental microbiology	EFB 303	be				
Principles of Genetics	EFB 307 & 308	be				
Cell Physiology	EFB 325	be				
Molecular Biology Techniques	BTC 401	be				
Σ		0	0	0	0	0
Biochemistry Courses						
Biochemistry I	FCH 530	be, ce				
Biochemistry Lab	FCH 531	be, ce				
Biochemistry II	FCH 532	be, ce				
Σ		0	0	0	0	0
Electives						
Junior or higher biology or biotechnology		0-9	9			
Junior or higher chemistry or biochemistry		0-9				
Junior or higher engineering electives		0-9				
Engineering, Biochemistry or Chemistry		0-9				
Science Electives				12	3	12
Technical Electives (Minor)						
Free Electives				6	3	6
Σ		9	9	18	6	18
Credit-hour summary						

be = Biology/Biochemistry/Biotechnology elective; ce = Chemistry elective; se = science elective; ee = engineering elective

Dual Degree Programs

There are dual degree programs in Bioprocess Engineering with Beijing University of Chemical Technology and with Sichuan University. The dual degree programs have

identical minimum requirements with the BS programs listed in this handbook.

Bioprocess Engineering Program

The bioprocess engineering program prepares students for careers as process engineers in renewable resources and biologically-related fields, filling positions that are typically filled by chemical engineers after having additional training. As we begin the 21st century, growth and development worldwide will need to be done in a sustainable manner that looks to the long-term future of the environment. We can no longer continue our dependence on fossil fuels, which are being consumed at a rate many orders of magnitude greater than their replenishment rates. The bioprocess engineering program seeks to train engineers versed in the traditional chemical engineering fields with a focus on developing products and energy from sustainable sources, especially from wood and other lignocellulosic materials.

Students in the program study a broad base of topics in the fundamentals of engineering focused on the chemical and biological processing of raw materials from sustainable sources. Emphasis in this program is on using renewable biomass resources to replace petroleum in energy and industrial product applications. Examples of such technology include the production of ethanol, acetic acid, polymers, and other chemicals that have traditionally been produced from petroleum.

The program provides valuable experience through a capstone design experience in which they work on significant problems in the design and implementation of new technologies. In addition, a summer internship is required of all students in which they gain valuable skills and experience, in terms of technical knowledge and professional development. Both of these experiences serve to integrate the knowledge gained in their coursework with real-world work experiences commonly seen in their first positions after graduation.

The curriculum consists of a number of categories of courses. The general education component, which is required of all ESF students, broadens the students' perspectives on global and societal issues, an important component of any education. Students also take a number of courses in math and the basic sciences—chemistry, physics, and biology—to provide the background for the courses that prepare students for engineering practice. The engineering courses cover a variety of topics that are traditional for a chemical engineering program, supplemented with courses specific to bioprocess engineering. *Differential Equations, Thermodynamics, Mass and Energy Balances, Fluid Mechanics, Transport Phenomena, Colloids and Interfaces, Bioseparations, Unit Process Operations, Bioprocess Kinetics and Systems Engineering, Bioprocess Engineering Labs, and Bioprocess Engineering Design* are the core courses for the Bioprocess Engineering Program. These courses are more "logical" and "quantitatively analytical", than "qualitative" or "recital". They prepare you with a versatile skill set. Learning how to "derive" "your own" equation from first principles propels you to excel.

The Bioprocess Engineering Program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET) *in compliance with the program criteria for Chemical, Biochemical, Biomolecular, and*

similarly named Engineering Programs. Students in this program usually take the Fundamentals of Engineering (FE) exam during their senior year and upon passing become an Engineer-in-Training (E.I.T.). After four additional years of engineering practice, they are eligible to take the exam to become a Professional Engineer (PE).

Licensure as a Professional Engineer is regulated state-by-state, so students have to comply with the requirements in the state in which they are working. In New York State, licensing information can be found at http://www.op.nysed.gov/pe.htm. Information regarding the FE exam is at http://www.ncees.org. Study materials and guides can be found at http://www.ppi2pass.com as well as at many other websites.

There are six elective concentration areas suggested for the Bioprocess Engineering program: Biomolecular Engineering, Biochemical Engineering, Bioenergy Engineering, BioPolymer Engineering, Biomaterials, Environmental Engineering, Industrial Engineering and Paper Engineering (compatible with the Paper Science minor). Each concentration area has suggested concentration courses to complete elective requirements of the BPE curriculum:

Biochemical Engineering

FCH 530 Biochemistry I
FCH 531 Biochemistry Lab
FCH 532 Biochemistry II
FCH 361 Physical Chemistry II
BPE 438 Introduction to Biorefinery Processes

BioEnergy Engineering

BPE 438 Introduction to Biorefinery Processes
FCH 524 Topics in Natural Products Chemistry
PSE 350 Fiber Processing
PSE 450 Pulping and Bleaching Processes

Biomolecular Engineering

EFB 325 Cell Biology
EFB 307 / 308 Principles of Genetics
BTC 401 Molecular Biology Techniques
FCH 361 Physical Chemistry II
BPE 498 Research Project in Protein or Fermentation Engineering

BioPolymer Engineering

FCH 361 Physical Chemistry II
FCH 550 Polymer Science: Synthesis and Mechanisms
FCH 551 Polymer Techniques
FCH 552 Polymer Science: Properties and Technology

BioMaterials

FCH 361 Physical Chemistry II
PHY 212/222 General Physics II
GNE 172 Statics and Dynamics

GNE 273 Mechanics of Materials
PSE 438 Biorenewable Fibrous and Nonfibrous Products

Environmental Engineering

ERE 440 Water and Wastewater treatment
GNE 461 Air Pollution Engineering
ERE 468 Solid and Hazardous Waste Treatment
FCH 510 Environmental Chemistry I
FCH 511 Atmospheric Chemistry

Industrial Engineering

GNE 172 Statics and Dynamics
GNE 273 Mechanics of Materials
PSE 437 Equipment Troubleshooting & Maintenance
PSE 492 Research Practice
PSE 456 Management in Industry

Paper Engineering (compatible with Paper Science Minor)

PSE 200 Introduction to Papermaking
PSE 202 Pulp and Paper Laboratory Skills
PSE 350 Fiber Processing
PSE 465 Fiber and Paper Properties PSE 468
Papermaking Processes

Program Educational Objectives: The objectives of the Bioprocess Engineering Program are to expect graduates:

To achieve rewarding careers in bioprocess engineering and related fields after graduation.

To demonstrate accomplishments in their careers through increasing professional responsibility and continued life-long learning.

Program Outcomes: By the time of graduation, each student in Bioprocess Engineering will have:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in, life-long learning

(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) an ability to work in an industrial or research position within the bioprocess or related fields.

Research Problems

Students with excellent academic standing can apply to participate in research problems (BPE 498) offered by professors in the department. While there is no limit on how many credits of BPE 498 can be taken by any individual, only **up to 5 credit hours of research and experience can be taken to fulfill elective course(s) requirements**. Examples of these projects include:

1. Membrane Bioreactor for Wastewater Treatment
2. Submerged Packed Bed Bioreactor for Wastewater Treatment
3. Gas Absorption with Chemical Reaction
4. Disintegration of Biomass: Study the ability to disintegrate various types of agricultural Biomass, by using a refiner, deflaker, disperger and or a similar disintegration machine. Evaluation of the disintegrated product will be done by visual inspection, consistency and viscosity measured at various consistencies.
5. Dirt Contamination of Biomass: Evaluation of the dirt content from different types of agricultural biomass. Study will include a microscopic study of the contamination particles, as well as handsheet preparation for reference.
6. Gasification: Gasification process studies of biomass in regards to generated heat & energy, charcoal, operational parameters, syngas content and usage.
7. Fermentation study: Aerobic and anaerobic fermentation applied to biomass processing.
8. Fertilizer recovery: Investigate the possibility of fertilizer recovery from effluent streams.
9. Composting biomass: Study of composting processes in regards to efficiency, process- and output parameters.
10. Soda Pulping: Deliginification kinetics and chemical equilibrium
11. Effects of additives on oxygen bleaching: deliginification kinetics and chemical equilibrium
12. Hot-water extraction of wood chips, agriculture residues (straws)
13. Examine the kinetics and chemistry of hot-water extraction.
14. Hydrolytic enzyme production.
15. The biokientics and chemistry of enzyme production via bacterial fermentation. The bottleneck in renewable energy / chemistry industry.
16. Enzymatic hydrolysis of cellulosic materials.
17. Biokinetics of cellulosic material conversion. Potential of renewable energy / chemical industry.
18. Ethanol fermentation from wood hydrolysate.
19. Effect of feedstock variability on fermentation. Benefit of ethanol production: intermediate chemical and liquid fuel.
20. Lactic acid fermentation from wood hydrolysate
21. Effect of feedstock on fermentation and lactic acid production. Potential of

biodegradable plastics from woody biomass.

22. Butanol fermentation from wood hydrolysate: Techniques of anaerobic fermentation and feedstock variation on butanol production. Benefit of butanol production in a renewable economy.
23. PHA fermentation from wood hydrolysate: Effect of feedstock on fermentation. Potential of biodegradable plastics from woody biomass.
24. MCC and NCC conversion from wood fibers: Chemical kinetics of fiber hydrolysis. Potential of MCC and NCC in industry.
25. Separations using membranes: Micro and Nano filtration
26. Flocculation of suspensions using polymers and electrolytes

Interested students should talk to their advisors and faculty regarding possible research projects.

More information can be found on the individual faculty web pages at: http://www.esf.edu/pbe/directory.

Paper Engineering Program

The paper engineering program is designed to provide greater depth in chemical engineering education for students preparing for an engineering career in the pulp, paper, and allied industry. Students graduating from this program are well suited for employment as process engineers in the paper industry, the allied chemical industry, as well as many other career opportunities. Graduates are well prepared to move into assignments in the engineering field and advance quickly to positions of responsibility in the analysis and design of processes, products, and equipment.

Courses present the principles of engineering with the disciplines and examples selected especially for the pulp and paper industry. Courses include study in the basic sciences-chemistry, physics, computer science-as well as engineering topics such as thermodynamics, transport phenomena, and design. The general education component, which is required of all ESF students, broadens the students' perspectives on global and societal issues, an important component of any education. The engineering courses cover a variety of topics that are traditional for a chemical engineering program, supplemented with courses specific to pulp and paper engineering.

Students in the program gain valuable experience through a capstone-design experience in which they work on significant problems in the design and implementation of new technologies. In addition, a summer internship is required of all students in which they gain valuable skills and experience, in terms of technical knowledge and professional development. Both of these experiences serve to integrate the knowledge gained in their coursework with real-world work experiences commonly seen in their first positions after graduation.

A total of 8 areas of directed electives provide flexibility to students for enriching their experience in more focused areas of study. Students are encouraged to take more courses than the minimum required for their experience. One (1) course must be from FCH 380, FCH 361 and PSE 467. At least three (3) courses must be chosen from ELE 231, GNE

172, GNE 273, ERE 440, GNE 461. At least four (4) courses must be taken from the following list that is separated by area of studies.

Fiber Chemistry: PSE 450, PSE 552
Paper and Fiber Properties: PSE 438
Mill Operations: PSE 436, PSE 437, PSE 492
Management: FOR 360, PSE 456
Bioresource Utilization: BPE 438
Sustainable Process Engineering: ERE 440, GNE 461, PSE 552
Paper Chemistry: PSE 467, PSE 469
Paper Fillers: PSE 466, PSE 469
Automation (Available from Exchange Program): Automation I, Automation II
Paper Products (Available from Exchange Program): Specialty Papers, Board and Paper Technology I
Coating (Available from Exchange Program): Coating I, Coating II
Printing (Available from Exchange Program): Coating Practical, Printing

The Paper Engineering Program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET). Students in this program usually take the Fundamentals of Engineering (FE) exam during their senior year and upon passing become an Engineer-in-Training (E.I.T.). After four additional years of engineering practice, they are eligible to take an exam to become a Professional Engineer (PE).

Licensure as a Professional Engineer is regulated state-by-state, so students must comply with the requirements in the state in which they are working. In New York State, licensing information can be found at http://www.op.nysed.gov/prof/pels/. Information regarding the FE exam is at https://ncees.org/engineering/fe/. Study materials and guides can be found at http://www.ppi2pass.com as well as at many other websites.

Program Educational Objectives: The objectives of the Paper Engineering Program are to expect the graduates:

- To achieve rewarding careers in paper engineering and related fields after graduation;
- To demonstrate accomplishment in their careers through increasing professional responsibility and continued life-long learning.

Program Learning Outcomes: By the time of graduation, each student in Paper Engineering will have:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems

(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) an ability to work in an industrial or research position within the pulp, paper, or related fields..

Research Problems

Students with excellent academic standing can apply to participate in the research problems (PSE 498) offered by professors along the active research activities in the department. Typical projects include:

1. Flow in a Tapered Header
2. Fiber Fractionation in a Hydrocyclone
3. Water Use and Recycle in the Pulp and Paper Industry
4. Use of Membrane Filtration in the Pulp and Paper Industry
5. Hybrid former design: Design of a hybrid former for our 12" laboratory paper machine
6. Paper filler process study: Design, building and testing of a laboratory in-situ precipitation unit, to precipitate calcium carbonate (PCC), including a hand sheet evaluation based on optical and mechanical properties.
7. Pulping Dispersing and Refining:Laboratory study on pulp and fiber behavior of various fiber materials including organic and inorganic materials.
8. Flotation and Processing of Recycled Paper: Application of novel flotation and process technologies applicable to recycled fibers.
9. Soda Pulping: deliginification kinetics and chemical equilibrium
10. Effects of additives on oxygen bleaching: deliginification kinetics and chemical equilibrium
11. Separations using membranes: Micro and Nano filtration
12. Flocculation of suspensions using polymers and electrolytes.

Interested students should talk to their advisors and faculty regarding possible research projects.

More information can be found on the individual faculty web pages at: http://www.esf.edu/pbe/directory/

Renewable Materials Science Program

The RMS program allows those students that are more science focused to prepare for a variety of careers in the wood, pulp, paper, polymer and allied industries. Students graduating from this program are well suited for employment in many different facets of these industries as well as many other career opportunities. Options are available to concentrate on particular areas in industry, such as management, chemistry, or biology.

This program prepares the student for careers in the technical, management, or technical representative areas with opportunities to extend interests in other directions.

The curriculum consists mainly of science and engineering courses, as well as specialized courses relating to the manufacture and use of wood, pulp and paper, or polymer products. There are three named options in the program, each of which has a separate plan sheet: Paper Science, Polymer Science and Wood Science.:

The student chooses to complete one of these options when enrolling at the college. Completing one of the college-wide minors is also possible. Completing a minor allows the student to specialize in a subject area of interest. The general education component, which is required of all ESF students, broadens the students' perspectives on global and societal issues, an important component of any university education.

Program Educational Objectives: The objectives of the Renewable Materials Science Program are to produce graduates who, during their first few years after graduation:

1. have a sound background in fundamental science and engineering principles as applied to renewable biomaterials;
2. understand related societal issues such as environmental protection and resource management;
3. are well-rounded professionals in terms of teamwork, communication, and problem solving;
4. have an in-depth knowledge in a particular area of science or management.
5. have developed life-long learning skills and abilities.

Program Learning Outcomes: By the time of graduation, each student in Renewable Materials Science will have:

1. a sound knowledge of physical sciences and elementary engineering and how they apply to technology in industry;
2. the ability to conceptualize problems in terms of unifying principles, the design and conduct of experiments, and how to analyze and interpret data;
3. the ability to work within a team environment;
4. an ability to engage in life-long learning;
5. well-developed written and oral communication skills.
6. the ability to work in an industrial position with an understanding of the professional and ethical responsibility required of an industrial scientist;
7. knowledge of the environmental and resource management concerns facing the industry.

Research Problems

Students with excellent academic standing can apply to participate in research problems offered by professors in the department. Start by speaking to your advisor.

Minor Areas of Study

The college currently offers 28 minor areas of study. Participation in a minor program requires students to carefully plan their curriculum, especially in the upper division. Minors require some special courses that may only be offered at certain times of the year. At the time of application to a minor, the student should lay out a program of study to indicate what courses are intended to be taken to satisfy the minor as well as when these courses will be taken. Instructions on how to enroll in a minor are as follows, copied from http://www.esf.edu/academics/minors.htm#top.

To apply for admission to undergraduate minors for ESF students, you must fill out the ESF Minor Enrollment Form. All ESF minors require a minimum of 12 credit hours, with others requiring up to 18 credit hours. All students must complete at least 6 credit hours in residence at ESF. Application requirements are noted in the descriptions of the minors below. Successful completion of a minor will be noted on the transcript of each student. Please be aware, if you pursue an academic minor, credit hours required above and beyond the total required for your primary degree (your major), may not be eligible for financial aid.

A PDF copy of the ESF Minor Enrollment Form is at ESF Minor Enrollment Form. The form is to be completed, printed, signed within the department and submitted to the registrar.

Applied Statistics Minor: This minor provides students with an opportunity to extend their understanding of and ability to apply statistical methods beyond the basic techniques presented in introductory courses. The minor is intended to provide students with a strong background in statistical design (both sampling design and experimental design) and analysis. The 12-credit minor consists of two required courses (6 credits), APM 391 (or APM 395) and FOR 323 and 6 credits of directed electives of advanced courses, independent study, or teaching experience related to applied statistics.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#as

Bioprocess Science Minor: The bioprocess science minor gives students an understanding of the rapidly developing bioprocessing industry, which uses the chemical, physical and biological processes developed by living organisms or their cellular components in a type of advanced manufacturing of specialty commercial products. Bioprocess science will influence diverse fields as it becomes widely used, such as for producing energy from sustainable sources.

The bioprocess science minor is available to all ESF undergraduate students (**except students in the bioprocess engineering program)** who maintain a minimum cumulative grade point average of 2.70, and who desire to develop greater knowledge of bioprocess science and its related fields. Interested students must submit a petition and application form, with courses listed, to their academic advisor and the chair of their department, with final approval from the dean of Instruction and Graduate Studies. Students should declare the minor by the end of the sophomore year, but may petition to their home

department for enrollment at any time after that. Successful completion of the minor will be noted on the student's transcript.

Eighteen credit hours (6 courses) are required to satisfy the minor. Specified courses: PSE 370 Principles of Mass and Energy Balance (3); BPE 310 Colloid and Interface Science (3); BPE 420 Bioseparations (3); and at least three directed elective courses available from both ESF and Syracuse University including biology, forestry, chemical engineering, chemistry, paper science and engineering, bioprocess engineering, and environmental and biological engineering. Students are required to complete at least one course from a list of biological and chemistry electives and at least one course from a list of engineering electives. The complete list of courses is available from faculty advisors.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#bs

Biotechnology Minor: The minor in biotechnology is for students who wish to add knowledge of biotechnology theories and methodologies to the experiences and qualifications gained from their undergraduate program. Required courses develop a basis for understanding biotechnology, both at the theoretical and practical levels. Directed electives allow students to focus on an area of interest in the field. The minor is available to all ESF undergraduate students except those in the biotechnology major.

Twenty credit hours of coursework are required for completion of the minor. Seventeen credits of specified courses include EFB 307 Principles of Genetics (3); EFB 308 Principles of Genetics Lab (1); BTC 401 Molecular Biology Techniques (4); EFB 325 Cell Biology (3); FCH 530 Biochemistry I (3); and FCH 532 Biochemistry II (3). One directed elective course (for a minimum of three credits) must be selected from the following list. A maximum of eight credits can count toward both major and minor requirements; overlap in excess of this number must be offset by taking additional courses from the directed elective list.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#biotech

Chemistry Minor: This is open to all undergraduates at SUNY-ESF. Admission to the Chemistry minor requires sophomore, or higher, status, students to have completed one year of General Chemistry (I and II) with lab (8 credits) and one year of Organic Chemistry (I and II) with lab (8 credits). Fifteen credit hours of upper division chemistry credits (300 level or above) are required.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#c

Computer and Information Technology Minor: The computer and information technology minor is available to all ESF undergraduates who want to develop greater skill in computer science and information technology applications. By understanding the basic principles behind software development, students can more effectively use these tools in their chosen fields. To be eligible for this minor, a student must have a

cumulative grade point average of 2.700 or better by the end of the sophomore year. Interested students must submit a petition form and plan sheet, with courses listed, to their academic advisor and undergraduate coordinator, with final approval from the Dean of Instruction and Graduate Studies. Eighteen credit hours (6 courses) in computer science and information technology courses are required to complete the minor.

Courses: Required courses can be found at: http://www.esf.edu/academics/minors.htm#cit

Construction Management Minor: The construction management minor is available to all ESF undergraduates (except students in construction management) and prepares students for management careers in the construction industry. Admission to the minor requires sophomore status, with a cumulative grade point average of 2.70 or higher.

Eighteen credit hours (6 courses) are required to complete the minor. Four courses are specified, with an additional two courses selected from the list of six courses given below. A cumulative grade point average of 2.000 or higher is required for the construction management courses.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#cm

Economics Minor: Economics analyzes how people with limited resources make choices and provides the fundamentals for good decision-making. The minor in economics provides students with common microeconomic models and tools that can be used to analyze optimal management and policy decisions in natural resources management. Admission to the minor requires students to have a cumulative grade point average of 2.70 or better after one semester at ESF (or as a transfer student with the same standing).

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#econ

Environmental Biology Minor: This minor provides students the opportunity to explore fundamentals of molecular, cellular and organismal biology and ecology and to develop laboratory and field proficiencies in the discipline. The minor is open to ESF undergraduate students, including those in biotechnology but excluding all other EFB programs, who maintain a GPA of at least 2.70 after completing at least one semester at ESF and who have completed the following prerequisite courses or their equivalents: EFB 101/102 and 103/104 General Biology (8); and FCH 150/151 and 152/153 General Chemistry (8).

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#eb

Environmental Health Minor: The Environmental Health minor will introduce students to environmental health with a core context of epidemiology and toxicology; the minor requires 15-17 credit hours. There are 3 required courses (7 credit hours): EHS250 Foundations of Environmental Health(1), EFB360 Epidemiology(3), and EFB400 Toxic Health Hazards(3). Students will have the flexibility to explore a variety of components by selecting an additional three courses (8-10 credit hours) from among the following: EHS440 Occupational Health and Safety(3), EHS350 Environmental Health

Management(3), EHS320 Disease Prevention(2), FST102 Food fights: Contemporary Food Issues(3), FCH399 Introduction to Atmospheric Science(3), ENS470 Environmental Risk Assessment(3), EST245 Foundations of Environmental Communication(3), EHS480 Hazardous Waste Management(3), EFB303 Introductory Environmental Microbiology(4).

The Environmental Health minor will be available to students in all majors (except Environmental Health) who want to increase their knowledge of the impact of the physical environment on human health. Some of the courses have additional pre-requisites, and students should investigate this before selecting courses to fulfill the minor requirements. Students must have a minimum GPA of 2.7 to apply. Interested students should submit the minor enrollment form accompanied by a list of courses to fulfill the minor requirements to their faculty advisor and the Environmental Health minor coordinator, with final approval from the Dean of Instruction and Graduate Studies.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#eh

Environmental Policy and Communication Minor: The minor in Environmental Policy & Rhetoric is open to all undergraduates at SUNY-ESF. To be eligible for entry into the minor, students need a minimum GPA of 2.70 and have successfully completed the prerequisite courses EWP 190 and EWP 290 or their equivalent (Students may apply for entry to the minor prior to completion EWP 290).

The minor in Environmental Policy and Communication is designed to provide students with the knowledge and skills to navigate the environmental policy process, to effectively communicate with diverse stakeholders in public and private spheres, and to critically reflect on and elucidate the interactions between scientific knowledge, social processes, and environmental problem-solving.

The Environmental Policy and Communication Minor is available to all ESF undergraduates. Twelve credit hours are required. All students must take a course on the Fundamentals of Environmental Policy (typically EST 321, Government and the Environment). Additionally, to complete the minor, students must take a course in Environmental Communication; an Upper Level Course in Environmental Policy, Leadership, or Decision Making; and a course in Critical Perspectives on Environment & Society. Admission to the minor requires sophomore status with a cumulative GPA of 2.70 or better.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#epc

Environmental Writing and Rhetoric Minor: The minor in Environmental Writing & Rhetoric is open to all undergraduates at SUNY-ESF. To be eligible for entry into the minor, students need a minimum GPA of 2.70 and have successfully completed the prerequisite courses EWP 190 and EWP 290 or their equivalent (Students may apply for entry to the minor prior to completion EWP 290).

Courses: Required courses can be found at:

http://www.esf.edu/academics/minors.htm#ewr

Food Studies Minor: The food studies minor will be available to students in all majors who want to increase their knowledge of the impact of food production systems, food security and food systems on human society and individual human health. Some of the directed elective courses have additional pre-requisites, and students must investigate this before making up their proposed course plan. Interested students (GPA 2.7 required in order to apply) must submit a petition, with a list of potential courses to fulfill the minor requirements to (a) their faculty advisor, (b) the undergraduate curriculum coordinator of their home department and (c) the food studies minor coordinator, with final approval from the Dean of Instruction and Graduate Studies. Many courses are offered at Syracuse University. Students pursuing this minor may incur additional fees as required for exceeding their SU accessory instruction allocation.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#food

Forestry Minor: The minor in forestry draws from the biological, physical, social, and managerial sciences. The curriculum aids in understanding the biological complexities of the forest and the interactions between the forest and social and economic demands. The minor is designed to provide students with an appreciation of forest resources management. Course themes include forest measurements, forest ecology, forest management and silviculture, and forest policy and economics. Admission to the minor requires students to have a cumulative grade point average of 2.70 or better after one semester at ESF (or as a transfer student with same standing).

Courses: Required courses can be found at: http://www.esf.edu/academics/minors.htm#f

Information Management and Technology Minor: In collaboration with the Syracuse University School of Information Studies (the i-School), ESF also offers an undergraduate minor in Information Management and Technology for ESF students. This minor is designed to give students knowledge of information technology and an understanding of information and communications problems. It complements many majors because all organizations need people who understand information resources and information technology. To be eligible for this minor, students must have a cumulative grade point average of 2.70 or better and apply for the minor after completing at least one semester at ESF, but as soon after that as possible to ensure all courses can be completed. It is preferable students begin the minor during their sophomore year.

Courses: Required courses can be found at: http://www.esf.edu/academics/minors.htm#imt

Landscape Architecture Studies: The minor in Landscape Architecture Studies provides an understanding of the natural and human factors and the role of design in shaping our physical environment. This minor is available to SU and ESF students. To complete this minor, students must complete 15 credit hours (5 courses) with a cumulative grade point average of 2.5. One course is specified, with an additional four courses to be selected from the list of seven approved courses listed below.

Admission to the minor requires a cumulative grade point average of 2.7 or higher and permission (ESF petition) of the Landscape Architecture Undergraduate Curriculum

Director (331 Marshall Hall).

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#lastudies

Management Minor: The management minor is available to all ESF undergraduate students who want to develop greater skills and knowledge of business fundamentals. In addition to understanding basic financial and managerial accounting principles, students can further develop focus in their minor through coursework in entrepreneurship, finance, marketing, human resources, and other topics.

Admission to the minor requires sophomore status, a cumulative grade point average of 2.70 or better and permission (via the ESF Minor Enrollment Form) of the Coordinator of the minor. Normally, students are allowed to take only one management course at Syracuse University's Whitman School per semester, so careful planning is required.
The management minor requires fifteen (15) credits, six (6) credits from a required course and nine (9) credits of elective courses. It is the responsibility of the student to meet any prerequisites associated with any courses in the minor.

Students in Bioprocess Engineering or Paper Engineering programs who take a management minor can apply for Joachim scholarships amounting to $300 / course and up to $1500 upon completion of a minor in management.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#m

Marine Science Minor: The marine science minor is available to students in all majors who want to increase their knowledge of marine systems. Prior to admission students must have completed one year of General Biology (EFB 101/102 and EFB 103/104) and one year of General Chemistry (FCH 150/151), or equivalent, and have earned a cumulative GPA of 2.70. Some of the directed elective courses have additional pre-requisites, which will not count toward the minor.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#marine

Mathematics Minor: The mathematics minor is available to all ESF undergraduates who have an interest in developing greater knowledge in the field of mathematics. To be eligible for this minor, a student must have a cumulative grade point average of 2.700 or better by the end of the sophomore year. Interested students must submit a petition form, with courses listed and plan sheet, to their academic advisor and undergraduate coordinator, with final approval from the Dean of Instruction and Graduate Studies. Sixteen credit hours (5 courses) in mathematics courses are required to complete the minor. Admission to the mathematics minor requires students to have completed Calculus I and Calculus II.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#math

Microscopy Minor: The microscopy minor is available to all undergraduates at ESF and Syracuse University who desire knowledge of methods and applications of light and

electron microscopes for research and industry. The minor will prepare students to use a variety of microscopes for applications in biology, nanotechnology, environmental medicine, chemistry, materials science, engineering, pulp and paper and others. Admission requires junior status and a GPA 2.70.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#micro

Native Peoples and the Environment Minor: The Native Peoples and the Environment minor is available to all ESF undergraduates. The interdisciplinary suite of courses provides students with a cohesive introduction to Indigenous cultures, worldviews and knowledge systems and their application to environmental thought. The minor creates a conceptual framework for integrating traditional ecological knowledge with western scientific approaches in service to the science of sustainability. Through the breadth of courses and experiences, students will gain an appreciation for both the global nature and the local context of indigenous issues and the environment. The minor includes a required team taught seminar which enhances opportunities for interdisciplinary and cross-cultural integration.

Fourteen credit hours (5 courses) taken in residence are required to complete the minor. Two courses are specified, with an additional two or three courses selected from the list below. An internship may be used to fulfill a course requirement, if focused on Native peoples and the environment. Admission to the minor requires sophomore status with a cumulative GPA of 2.70 or better.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#npe

Paper Science Minor: The paper and related industries (including pulp, mineral, chemical and machinery suppliers) continually seek knowledgeable and skilled employees. Each year, companies hire numerous graduates of chemical, mechanical and environmental engineering programs as well as chemists and other environmental professionals in addition to paper science and engineering graduates. Salaries for new hires are among the highest for all fields of study at the bachelor's degree level. This minor gives students a thorough understanding of the paper industry that will allow them to apply their major field of study to this growth industry.

The paper science minor is available to all ESF undergraduate students (**except students in the paper engineering programs**) who maintain a minimum cumulative grade point average of 2.70 and who desire to develop greater knowledge of paper science and its related fields. It is recommended that a student enter the minor by the end of the sophomore year, but entry at a later date is possible if course coverage is already in progress.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#ps

Physics Minor: The physics minor is available to all ESF undergraduates who have an interest in developing greater knowledge in the field of physics. To be eligible for this minor, a student must have a cumulative grade point average of 2.7000 or better by the

end of the sophomore year. Interested students must submit a petition form, with courses listed and plan sheet, to their academic advisor and undergraduate coordinator, with final approval from the Dean of Instruction and Graduate Studies. Sixteen hours (6 courses) in physics courses are required to complete the minor. Admission to the physics minor requires students to have completed General Physics I (with lab).

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#phy

Recreation Resource and Protected Area Management Minor: This minor provides students with the opportunity to combine visitor management with protected area management. Understanding the need to balance the opportunity for visitor experiences with protecting and stewarding protected areas provides professional insight into planning and managing those areas for limited visitor access. Understanding the motivations, preferences, and behavior of recreational users is necessary to integrate the human dimensions into protected area management with consideration of the social and environmental factors related to such management. Protected area managers need to be able to manage both the resource itself as well as a wide variety of users, such as campers, hikers, bird watchers, boaters, nature photographers and others who enjoy nature-based experiences in extensive protected area environments owned by public agencies, private landowners, or NGOs.

Students from all programs at ESF are eligible for this minor if they have completed a general ecology course and have a cumulative grade point average of 2.70 or better in their major program of study after one semester at ESF (or as a transfer student with same standing). Overlap between the minor and both one required course and one directed elective for a student's major is permitted; other courses taken for the minor can not overlap with the major.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#rrpam

Renewable Energy Minor: The development of sustainable sources of energy has become a critical national and global issue due to concerns about the quality and quantity of the different potential resources, energy security, and potential impacts of each on the environment and human health. It is essential that our society and energy professionals gain an understanding of production and conversion of different forms of energy, their current and future supplies, the markets and policy mechanisms that regulate their supply, and the associated impacts on the environment for each fuel. In the past both traditional and renewable energy sources have been studied one resource at a time and usually from the perspective of a single discipline. This minor will provide students an opportunity to examine different sources of traditional and renewable energy simultaneously in the context of our total energy use using a systems perspective. Students will be exposed to views from a variety of disciplines as they wrestle with a wide array of issues related to current and future energy supply and use.

The understanding and development of renewable energy requires expertise from a wide range of disciplines. This minor will be interdisciplinary in nature with instructors from

different disciplines teaching the core courses. The Renewable Energy minor is available to all ESF undergraduate students (**except students who are in the renewable energy option in environmental science**) who have taken EFB 120 Global Environment & the Evolution of Human Society which is a prerequisite for ENS 325 Energy Systems, and have a GPA of 2.70 or better by the end of their sophomore year. The minor will require a minimum of 15 credits, 12 of which are required courses. The remaining 3 credits can be selected from a list of suggested courses.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#re

Sustainable Construction Minor: Coordinators: Paul Crovella & Dr. Susan Anagnost
The sustainable construction minor is available to all ESF undergraduates (except students in construction management) and prepares students for careers related to sustainable construction. The objective of the minor is to provide a fundamental understanding of the concepts and methods used to take a design into the field and build a quality sustainable structure in the most efficient and effective manner with minimal environmental impact. Admission to the minor requires sophomore status and a cumulative grade point average of 2.70 or higher. A cumulative grade point average of 2.000 or higher is required for the sustainable construction management courses in order to obtain the minor.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#sc

Urban Environmental Science Minor: While many people often associate the environment with wild lands and linked rural areas, many of the most important environmental and quality-of-life issues of the coming decades will be related to the urban environment. ESF, under its Urban Initiative, offers a campus-wide minor in urban environmental science. All students, but perhaps especially those with an intimate knowledge of the challenges facing city inhabitants, will find this program stimulating and provocative and will find professors interested in working with them to learn about and develop improved urban environments. Graduates of the program can make important professional contributions on issues ranging from urban forestry and urban wildlife, to urban air and water quality, population growth and urban sprawl, and environmental justice and equity.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#ues

Urban Forestry Minor: The Urban Forestry minor will provide students with the opportunity to better understand complex human-dominated ecosystems where trees and people coexist in close proximity. Understanding and attempting to manage this complexity requires a basic knowledge of plant physiology, nutrition, and tending at the individual tree level (arboriculture). In addition, the urban forester also must understand the changing dynamic of groups of trees and the effects of those trees on numerous ecosystem services and human health and well-being in a city (urban forestry). Because human activity is so dominant in the urban ecosystem, it is essential that the urban forester have some understanding of ecological interactions and human motivations for sustaining and maintaining existing trees (urban ecology). The courses will provide the

professional knowledge required for careers in these and related fields. The interdisciplinary minor includes courses taught in the Departments of Forest and Natural Resources Management, Environmental Studies, and Landscape Architecture. Admission to this minor requires students to have (1) completed a general ecology course (e.g. EFB 320 General Ecology), (2) a cumulative grade point average of 2.70 or greater after one semester at ESF (or as a transfer student with the same GPA).

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#uf

Water Resources Minor: Water resources is a multi-disciplinary field that integrates the physical, geochemical and biological processes of the water cycle and their application to management of water resources, water policy, and human dimensions of water quality and quantity. The interdisciplinary minor in water resources is designed as a flexible program for undergraduate students to study and integrate principles of physical hydrology, geochemistry, aquatic and terrestrial ecology, natural resources management, and environmental policy. This interdisciplinary minor can include SUNY ESF courses in the Departments of Forest and Natural Resources Management, Environmental Resources and Forest Engineering, Environmental and Forest Biology, Chemistry, and Environmental Studies, as well as courses at Syracuse University in relevant departments including Earth Sciences, Geography, Civil and Environmental Engineering, and Biology. The minor comprises 15 credit hours total, including one required course, FOR 442 Watershed Ecology and Management (3). The remaining twelve units must be taken from a list of approved elective courses in at least two separate departments. Admission to this minor requires that a student from any ESF program has a cumulative grade point average of 2.70 or better after one semester at ESF (or as a transfer student with same GPA). Students are responsible for meeting the prerequisite requirements for individual courses, as applicable.

Courses: Required courses can be found at:
http://www.esf.edu/academics/minors.htm#wr

Typical PBE Curricula

The PBE curricula have been designed to follow a certain sequence of classes in order to build on the subject matter during your studies at ESF. While the ideal situation would have a student take the courses in their desired order, some flexibility has been built into the curriculum to allow for exceptions. In Appendix B, "typical" schedules can be found that allow a student to complete a B.S. degree in Bioprocess Engineering, Paper Engineering, or Renewable Materials Science. It is important to remember, however, that these schedules reflect the curriculum as described in the most recent catalog. Students are "grandfathered" into the requirements stated in the catalog that was current when they entered, unless the student has opted to follow the latest catalog. The catalog in force when the student matriculated is called the Catalog of Record. These catalogs are located at http://www.esf.edu/catalog/. A student cannot choose to follow an earlier catalog than when they matriculated. In addition, students cannot pick requirements from several catalogs: they must choose one catalog and meet the requirements of that catalog. Students are assumed to be following the catalog that was current when they first entered ESF unless they have petitioned to follow another catalog. Appendix B contains sample

schedules each program.

With careful planning, a student can usually meet the requirements for a minor by taking courses required for the minor as electives for their BS degree. In some cases, students even acquire two minors. Students who fit a minor into their program may require at least one additional semester to graduate.

The Plan Sheet is a very important document that should be reviewed at least once every semester, especially when working on schedules for future semesters. The plan sheet is a checklist to ensure that the student is taking the courses that are necessary to fulfill the degree requirements. In general, students must satisfy each of the requirements on the sheet with a course taken at ESF, transferred from another college, or satisfied in some other way. Changes to the plan sheet require a petition from the student to the advisor, the department chair, and the college registrar.

It is very important that errors on the plan sheet be corrected as soon as possible, since advisors also use this sheet to help decide what classes need to be taken. The PBE curriculum advisor and the ESF Registrar use the plan sheet to ensure that the student has fulfilled every course requirement before a Bachelor degree can be awarded.

Course Prerequisites

The catalog provides course descriptions and prerequisites of each course offered at SUNY-ESF http://www.esf.edu/catalog/courses/intro.htm. Students must satisfy these prerequisites before taking the course because the prerequisites are part of the foundation that the course instructor relies on for information presented in the course. For example, the prerequisites for PSE 370 are PHY 211 and FCH 152. It also has a co-requisite of APM 206. Note that the prerequisites to PSE 370 themselves have prerequisites: FCH 150 is a prerequisite for FCH 152. Thus, in order to take PSE 370, a student must have taken APM 205, PHY 211, FCH 150, and FCH 152. A student must be either currently enrolled in APM 206 or have previously taken it.

Exceptions to these prerequisites can be granted under unusual circumstances. To be granted an exception, a Petition Form must be filled out and approved prior to registering for the class. Advisors will not sign S.C.O.R.E. forms for classes for which students do not meet the prerequisites and do not have permission for an exception. Any exceptions must be approved by the instructor, the advisor, the curriculum coordinator, and the department chair. Students registered for classes for which they have not taken the prerequisites and have not received approval run the risk of having their registration for the class cancelled, even though they may be well into the semester. Students anticipating the need to take classes without meeting the necessary prerequisites should begin discussing the possibility and options well in advance of advising week in order to allow time to get the necessary permission.

Directed Electives

Bioprocess Engineering Students completing the Bioprocess Engineering program must complete nine credits of directed electives to satisfy graduation requirements. General

requirements for these directed electives are that they must be taken from junior or higher courses in biology or biochemistry, chemistry, or engineering.

The directed elective requirement can be satisfied by completing one of the college-wide minors listed below:

Bioprocess Science
Biotechnology
Computer and Information Technology
Management
Renewable Energy.

Students not completing one of the listed minors must complete at least nine credits of department-approved technical elective concentration coursework in one of the following areas:

Biology
Chemistry
Pollution abatement
Applied mathematics
Computer modeling
Mechanics
Engineering design
Materials science
Biotechnology
Wood science
Other Department-approved areas.

Requirements for the various concentration areas are given in Appendix C.

Paper Engineering Students completing the Paper Engineering program must complete nine credits of engineering electives.

Suggestions for directed elective are available from the student's advisor. Suggested engineering concentration areas are: biomolecular engineering, biochemical engineering, biopolymer engineering, bioenergy engineering, biomaterials, environmental engineering, industrial engineering or paper engineering.

Renewable Materials Science Students completing the Renewable Materials Science program take a large number of required science courses. In addition, they are able to take electives, as follows: Paper option, 6; Polymer option, 3; and Wood option, 6.

Suggested directed electives include

BPE 335, Transport Phenomena
ERE 440, Water and Wastewater Treatment
PSE 371, Fluid Mechanics
PSE 477, Process Control
PSE 480, Engineering Design Economics
PSE 481, Engineering Design.

General Education Requirements

While the technical knowledge of Bioprocess Engineering, Paper Engineering and Renewable Materials Science is understandably very important, a broad base of knowledge outside but integrated with the technical knowledge is equally important. Most recruiters expect our graduates to have the technical knowledge. Thus, they tend to look beyond the technical knowledge and towards the "people skills" in their hiring decisions. The general education program provides groundwork for these skills by providing knowledge and exposure to different aspects of our society and other cultures. Students are encouraged to develop skills necessary for interacting in society both professionally and personally through well-chosen courses that fulfill general education requirements in areas such as history, civilizations and cultures, communication, the social sciences, and the humanities.

To fulfill the General Education Requirements (GER) in Bioprocess Engineering, Paper Engineering and Renewable Materials Science at ESF, each student will demonstrate knowledge and competency in seven (7) out of the following nine (9) subject areas.

1. Mathematics*
2. Natural Sciences*
3. Social Sciences*
4. American History
5. Western Civilization
6. Other World Civilizations
7. Humanities*
8. The Arts*
9. Basic Communication*

The student satisfies the GER by taking at least one course in each of the outcomes. Categories marked with an asterisk (*) are satisfied by required courses in Paper Engineering and Renewable Materials Science. Students in Bioprocess Engineering take at least one course from the other categories, as well as one arts course. Acceptable courses are listed by the registrar at http://www.esf.edu/registrar/gened.asp.

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.

PBE offers four opportunities to study abroad. These are:

1. BPE 230 (The China Experience). The course is offered in even years during the Maymester. It is offered to all students at SUNY-ESF and satisfies a general education requirement. Coordinator: Dr. Shijie Liu
2. Darmstadt semester abroad, primarily of interest to Paper Engineering students. Students take a semester of courses at the international institution and work at an internship at a

German company. The total time in country is approximately 11 months. Coordinator: Dr. Klaus Doelle

3. Sichuan exchange program. Students from Sichuan University began in the Fall 2010. Coordinator: Dr. Shijie Liu. Courses here are more focused on the lower division and general education.
4. Beijing University of Chemical Technology dual degree program. This program began in Fall 2010 in Bioprocess Engineering. Coordinator: Dr. Shijie Liu

Engineering Accreditation

ABET stands for the Accreditation Board for Engineering and Technology. It is the primary organization responsible for monitoring, evaluating, and certifying the quality of engineering, engineering technology, and engineering-related education in the United States. ABET is a federation of 28 technical and professional societies representing nearly 2 million engineering professionals. Bioprocess Engineering is accredited by the Engineering Accreditation Commission of ABET, *in compliance with the program criteria for Chemical, Biochemical, Biomolecular, and similarly named Engineering Programs*. Paper Engineering is accredited by the Engineering Accreditation Commission of ABET, *in compliance with the general criteria*. The Renewable Materials Science program is accredited by Middle States, as are all other programs at ESF.

ABET accreditation is based on the past performance of the program under consideration. The principle objectives of accreditation are:

1. To assure that graduates of an accredited program are adequately prepared to enter and continue the practice of engineering;
2. To stimulate the improvement of engineering education;
3. To encourage new and innovative approaches to engineering education and its assessment;
4. To identify these programs to the public.

ABET Accreditation in PBE

ABET accreditation is very important to the Department of Paper and Bioprocess Engineering. The value of accreditation to the Department and its students includes the following:

1. Provides a smooth path to the professional engineering license for Paper and Bioprocess Engineering graduates;
2. Provides an external viewpoint for program assessment and improvement;
3. Motivates the faculty to focus on quality improvement and the acquisition of resources needed to achieve excellence;
4. Reinforces Paper Engineering as an engineering program.
5. Reinforces Bioprocess Engineering as a versatile engineering program.

ABET accredits programs, not departments, schools, or universities. The Paper Engineering program was the first program in the department to be accredited by ABET. The Bioprocess Engineering program is accredited by ABET *in compliance with the program criteria for Chemical, Biochemical, Biomolecular, and similarly named*

Engineering Programs. The quality control, assessment, and improvement procedures implemented to meet the Engineering 2012 Criteria benefit and improve all programs within the Department.

Students in the Department of Paper and Bioprocess Engineering have several important responsibilities related to the ABET accreditation process. First, instructors must prepare course notebooks for every BPE and PSE course in their program during the year prior to an accreditation visit. The visiting ABET team reviews these notebooks, which constitute an important part of the Department's documentation for the visit. Examples of student work are a very important component of these notebooks.

Second, students must participate actively in the assessment feedback endeavors of the Department. This includes completing course evaluations completely and honestly and informing the Department about areas that need improvement.

Third, students in Paper Engineering and in Bioprocess Engineering are expected to become familiar with the ABET design process and how it relates to the activities of a process engineer. Students in Bioprocess Engineering are also expected to be aware of process safety, including reactive hazards. BPE students are encouraged to become involved with AIChE.

Fourth, students meet with the ABET reviewers during the accreditation visit to discuss various aspects of the Department, the Paper Engineering Program or the Bioprocess Engineering, and their experiences.

Becoming a Professional Engineer

Students who graduate from the BPE and the PEN programs have started the process to become Professional Engineers. Professional licensure protects the public by enforcing standards that restrict practice to qualified individuals who have met specific qualifications in education, work experience, and exams.

In the United States, licensure for the engineering and surveying professions is regulated by each state. Candidates interested in pursuing licensure are encouraged to check the requirements in the state or territory where they plan to practice.

In order to become a professional engineer in New York State, applicants must demonstrate an educational background by graduating from an EAC/ABET accredited program and must pass the *Fundamentals of Engineering* exam as a first step. Students/applicants who are within twenty credits of graduation (generally during the final semester) may take the exam. After passing the exam, the person must demonstrate engineering experience by professional employment.

Fundamentals of Engineering Exam

Students in the Paper Engineering and Bioprocess Engineering programs are eligible and are expected to take the *Fundamentals of Engineering* Exam during their senior year, typically in the spring semester. This is the first step (other than graduating from an

EAC/ABET accredited program) to becoming a licensed engineer. The examination is offered twice a year at various locations throughout New York State. To take the April exam, your completed application must be postmarked by 1 November of the previous year. The website http://www.op.nysed.gov obtains the information regarding the fees and how to obtain an application. Instructions and application packets are available from Dr. Scott in late September.

The examination consists of two parts. As an example of the exam, topics for the chemical engineering exam are given in Appendix I. PBE students should strongly consider either the chemical or general exam.

For students desiring more information on the FE exam and professional licensure, the following websites are helpful:

http://www.op.nysed.gov - NYS Office of the Professions
http://www.ncees.org - National Council of Examiners for Engineering and Surveying
http://www.ppi2pass.com - Professional Publications, Inc.

There are many other websites that contain information on the exam, practice exams, study guides, and study courses.

Engineering Code of Ethics

The faculty and staff in Paper and Bioprocess Engineering believe strongly 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 J of this handbook.

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.

General Lab Safety

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

Places to Study

Moon Library has many tables where individual students or groups of students can study alone or on group projects. The library has a room dedicated to quiet study as well as carrels located on just west of the stacks.

In Walters Hall, Room 402 is a study room. Room 320 in Walters is designated as the Starting Point Library. Check it out. On the third and fourth floors of Walters Hall chairs have been placed in the hall next to the large round columns that are convenient for studying.

Study Breaks

The Gateway Building is the primary locations for meeting friends, having something to eat, etc. Try The Trailhead Café in the basement of Marshall Hall, which is a smaller version of Gateway, and which is open for a more limited number of hours. Walters 415 is for study breaks or snacks, with a refrigerator and microwave.

Computer Clusters

Computing at ESF is under the control of Computing and Network Services (CNS).

They are located on the third floor of Baker Laboratory. When you enter Baker Laboratory from Jahn Hall, the bridge connecting the two buildings takes you directly to the third floor of Baker Lab. If you need any assistance with computing, including campus resources and email, go to their Help Desk or email them at http://helpdesk.esf.edu/cns/helpdesk/requesthelp.aspx.

ESF has large classrooms for computer use in Baker as well as a smaller lab in Moon Library. These classrooms are:

Lab	# of Computers	Teaching Station & Projector?	Max Occupancy
Moon 14	20	Not Applicable	23
Baker 309	38	Yes	50
Baker 310	24	Yes	35
Baker 314	32	Yes	45
Baker 319	23	Not Applicable	50

In addition, there is a smaller computer lab in room 209A of Walters Hall.

Writing Resource Center

ESF maintains a Writing Resource Center in 13 Moon. This center is available to all students. For international students, there is another writing center in room B05 of Marshall Hall.

Academic Advising

A primary goal of the Department of Paper and Bioprocess Engineering is to insure that all bioprocess engineering, paper engineering and renewable materials science students progress through the academic programs in their intended course sequences while meeting all prerequisite requirements. Academic advising is the principle mechanism through which this goal is achieved. Successful academic advising is the result of cooperative efforts between both students and faculty. The following information is intended to assist students as they participate in this important activity.

Before the student arrives at the College, the Curriculum Coordinator acts as a temporary advisor and helps prepare registration materials for the initial semester on campus. Soon after arriving, often during the first week of the semester, students are assigned a permanent advisor, who is a member of the Department of Paper and Bioprocess Engineering. Under normal circumstances, students keep the same advisor for their entire time until graduation, but a student can request a change in advisor. The academic advisor provides support and guidance for academic decision-making in the department.

Although the advisor is available to help and answer questions, the student is responsible for academic progress in the program. Students are responsible for scheduling advising meetings at least once each semester (during advising week and other times as necessary) prior to registration in order to discuss their course plans. Students must prepare for these meetings by knowing which courses they need, when they are offered, which sections

they wish to elect, and whether or not they meet the prerequisite requirements for each course. If a student does not have prerequisites, he or she cannot take the course. There will be few, if any exceptions to this. If a student does not meet the prerequisite requirements, they must be prepared to suggest alternative solutions to this problem, such as course substitutions or other alternatives. Any variations from the prerequisites must be approved by the advisor, the instructor, the Curriculum Coordinator, and the Department Chair. This is done using the SUNY ESF form entitled Petition to the Faculty. This approval must occur during the semester ***prior*** to the semester in which the course or courses are to be taken. **Courses for which a student does not meet the prerequisites and for which he or she does not have a completed and approved Petition Form waiving the prerequisites are subject to cancellation at any time prior to or during the semester.**

Students must meet with their academic advisor every semester prior to registration in order to discuss the courses being taken the next semester. At this meeting, students will fill out a S.C.O.R.E. form, which is then signed by the advisor. This is the student's permission to register. **Students cannot register for a class without a signed** S.C.O.R.E. form. Courses for which a signed S.C.O.R.E. form has not been submitted to the registrar are subject to cancellation any time prior to or during the semester.

The SCORE form (a copy is shown below) must be signed by your advisor and then delivered to the Registrar's office at 111 Bray Hall before it is possible to register. Detailed registration information is provided by the ESF Registrar at http://www.esf.edu/registrar/reginfo.htm.

SUNY ESF REGISTRATION FORM

Student ID				Last Name			First Name	
				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 _____

Student Signature _____ Advisor / Major Professor _____ Date _____

White Copy: Registrar Yellow Copy: Student

Adding and Dropping Courses

All adding and dropping of courses should be done in consultation with the advisor. The advisor will be able to tell you how schedule changes that are made this semester may affect schedules in future semesters and even the graduation date. Depending on when during the semester students change their schedule, slightly different procedures are followed. The table below outlines the process by indicating the form to be used and the required signatures. It is important to note that as the semester progresses, dropping a course requires increasingly more signatures and effort. Dropping a course after the last drop date will be permitted only under the most unusual circumstances.

Table 2. Forms and signatures required when adding and dropping courses

Time Frame	Adding a course	Dropping a course
During registration	S.C.O.R.E. Advisor signature	S.C.O.R.E. Advisor signature
Through last add date as stated in Academic Calendar	S.C.O.R.E. Advisor signature	S.C.O.R.E. Advisor signature
Through last drop date (approx. mid semester)	Courses cannot be added	S.C.O.R.E. Instructor and advisor signatures
After last drop date	Courses cannot be added	Petition Instructor, Advisor, Curriculum Coordinator, Chair, Dean signatures

Petitions and Transferring Courses

Students occasionally need to submit petitions for consideration by the Department and the college. A petition is a request for exceptions to or substitutes for academic requirements. Petitions are most often used to receive transfer credit for classes taken at another university prior to attending ESF and for receiving credit for courses taken at other universities while attending ESF (for example, summer classes at a community college). For obtaining credit for a class that did not transfer when you started at ESF, the student should fill out the petition and supply the appropriate documentation (e.g. a syllabus for the course taken) to support the position that it should have transferred. If the student plans to take a course at another university to satisfy a requirement for PBE, it is very important that the petition is approved **before** taking the class. This will guarantee that the course will transfer as expected.

The steps for completing a petition are as follows: Discuss the petition with your advisor. Your advisor will be able to help you fill out the petition and describe the supporting documentation you will need. Remember: Your petition must be justified and supported with the appropriate documentation.

Obtain a petition from the Registrar's Office (111 Bray) or from the Office of Instruction

and Graduate Studies (227 Bray).

1. Fill out and sign the top of the form.
2. Use a short sentence to state the request.
3. Make a short, clearly written statement to justify the request.
4. Attach any documentation that you feel the persons reviewing the petition will need to approve your petition. As an example, include the syllabus of a course taken at a different college that you want to add to your plan sheet.
5. Obtain the following signatures approving your petition:
    a. The course instructor (if applicable)
    b. Your advisor
    c. The PBE Curriculum Coordinator
    d. The chair of the PBE department
6. Submit the completed form to the Office of Instruction and Graduate Studies (227 Bray).

After the petition is approved, it will be forwarded to the Registrar's office and placed in the student's academic file.

Accessory Instruction

In the course of the students' education at ESF, they may take some classes at Syracuse University through what is known as accessory instruction. Accessory instruction allows students to take SU courses while paying SUNY tuition. Given the difference in tuition between the two colleges, this is quite a bargain. Newly-enrolled freshmen (not transfer students) are given an allotment of 16 credits for SU courses. Transfer students are provided with smaller allotments on a sliding scale depending on the numbers of credits they have already completed. Students may take more SU courses than their allotment at the rate of $351.50 per credit hour. If the same course (content, not necessarily number) is taught at both ESF and SU, ESF students are required to take the ESF course. For example, Physical Chemistry is taught at both ESF (FCH 360) and SU (CHE 346). ESF students must take FCH 360. ESF students may not register during a semester for only SU courses.

Exceptions to this policy will be approved in only the most unusual circumstances. Permission to take a course at SU which is also offered at ESF requires the permission of your advisor and the curriculum coordinator. The registrar will also review any requests for accessory instruction. This is done using the SUNY College of Environmental Science and Forestry form entitled Petition to the Faculty. This approval must take place during the semester prior to the semester in which the course or courses are to be taken. Accessory instruction courses taken without this approval are subject to cancellation at any time prior to or during the semester.

More information can be found at: http://www.esf.edu/registrar/accessory.htm

Student Email Accounts

SUNY-ESF has established e-mail as the primary vehicle for official communication

with students, faculty, and staff. ESF uses Syracuse University's SUmail for student accounts. Each ESF student is given a *.syr.edu e-mail account. All University communications sent via e-mail will be sent to the syr.edu address. Students are responsible for all messages sent to this e-mail address. The account provides access to your space on a central computer system. Students, faculty and staff receive a free account for:

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

To access your official e-mail address, you must first activate your ITS computing account. To do that, go to the web site at https://sumail.syr.edu/default.aspx. SUmail is the Syracuse University's Web-based e-mail system that students use to set up their official syr.edu e-mail address. Information about using SUMail is available on the Web at http://its.syr.edu/email/mymail. For further questions, contact the Syracuse University 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 e-mail 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 SUmail. 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.

Summer Internship and Co-op Programs

Bioprocess Engineering and Paper Engineering students enjoy the advantage of hands-on learning in the bioconversion, pulp, paper, and allied industries through paid internships and co-ops. PBE students are required to complete a two- credit, 12-week summer intern program in the industry (BPE 304 for Bioprocess Engineering Students and PSE 304 for Paper Engineering Students). Internships provide students with valuable experience, financial benefits, and two credits towards graduation. Students must submit a mill report, give a short presentation on their experience, and complete an evaluation. In addition, the student will be evaluated by their employment supervisor during their internship. Details for the report, presentation, and evaluation are given in the Appendix.

Students who complete a co-op in addition to the 12-week internship find the experience highly valuable because they are often able to see engineering projects through to their completion. Generally, students who have had the co-op experience are highly sought after for permanent employment. Many employers use the co-op experience as a "trial period" before offering permanent positions upon graduation.

The co-op position is approximately 7 months in duration, either beginning in May and ending in December, or beginning in January and ending in August. Usually it takes students who complete a co-op take one to two extra semesters to graduate. Additional work periods in subsequent summers are possible, and students are often invited back to the same company. In general, the timing, duration, and number of work periods is up to the employer and the student. Overall, the purpose of the co-op program is to provide career- related work experience in conjunction with the education program in Bioprocess Engineering and Paper Engineering. Co-op students are enrolled for two credits and are required to submit a co-op project report in addition to the mill report required for the summer mill internship. As with the summer report, a short presentation and experience evaluation are also required. Note that participating in the co-op program will generally delay the student's graduation by one year for a total of five years. However, the extra semester of course work allows lighter loads to be taken.

The co-op program allows students to get "real world" experience before graduation and gain important industry contacts. The student benefits in several ways from the co-op experience. First, these positions are paid positions, earning anywhere from $10 to $18 or more per hour or up to $16,000 for the seven month experience. This allows the student to earn money for college. Participation in the co-op program is recorded on the students' transcript, which indicates to potential permanent employers that you have valuable practical experience and training. This experience can potentially increase the salary level and the number of job offers received upon graduation. Students also benefit from the co-op experience in less tangible ways. The program:

- Provides an opportunity to test classroom learning in the "real world." This allows the student to better see the connection between classroom learning and full-time employment.
- Develops important professional skills in the student including technical writing and presentation skills. These skills can be brought back to the classroom at great benefit to the student.
- Offers career-related experiences in the students' field. Thus, the student can gain a clearer perspective of the various career options that are available and guide their remaining coursework to meet their career goals. A student can find out what engineers do in the paper industry before committing a full four years of college education towards this goal.

To be considered eligible for the co-op program, the student must meet the requirements listed below. Individual employers may impose additional requirements for eligibility.

1. Successfully complete a certain amount of coursework in a PBE program. As a minimum:
    a. PSE 200 (Introduction to Papermaking) and PSE 202 (Laboratory Skills) **or** BPE 300 (Introduction to Industrial Bioprocessing) and at least one semester of Biotechnology
    b. A writing course (preferably a *technical* writing course)
    c. General chemistry (2 semesters)
    d. Calculus (2 semesters)
2. Have been in residence at least one semester at ESF
3. Attend co-op orientation seminars provided by the PBE Department

4. Interview with perspective employers when they come to campus to interview

On-Campus Interviewing

An employment interview schedule begins in mid-October following the Syracuse Pulp and Paper Foundation's annual meeting. Some companies schedule interviews for co-ops and summer internships at the same time that they hold interviews for permanent positions. Other companies choose to hold interviews for co-ops and interns in the spring semester. Interview schedules will be posted up to three weeks before the interview date on the bulletin board outside of Room 205. It is the students' responsibility to periodically check the board for new postings. After signing up, carefully note the time that you signed up for. Missing a scheduled interview will result in the revoking of all future interviewing privileges.

On-campus interviewing is a privilege; it is not a right. This is true for both summer internship interviews as well as interviews for permanent positions. To be eligible for on-campus interviews, you must be a currently enrolled student in the Department of Paper and Bioprocess Engineering. Recent alumni are eligible to interview for permanent positions. Before being allowed to sign for interviews, both permanent and summer/co-op positions, a student must accomplish the following:

1. Attend a resume preparation seminar;
2. Attend an interviewing workshop;
3. Prepare a resume;
4. Fill out an **Interview Information Sheet** and turn it in to the PBE Office. This form is in the Appendix.

The privilege of using the on-campus interview service will be denied those students who engage in unethical or unprofessional behavior or do not adhere to the On Campus Recruiting Policies given in the Appendix. This behavior can take place either at the College or during summer or mill experiences. The loss of interview privileges does not excuse the student from the summer mill internship requirement in order to graduate.

Behavior that will cause the termination of on-campus interview privileges include:

- Drug use on campus or off;
- Failure of a drug test as a condition of employment (especially employment gained through an on-campus interview);
- Failure to complete a summer or co-op job term without appropriate explanation (wanting to take a vacation or not wanting to work to the end of the job term is not appropriate);
- Missing a scheduled job interview without good reason (oversleeping is not an acceptable reason);
- Inappropriate behavior during an interview either on-campus or off-campus;
- Inappropriate behavior during a summer or co-op work experience;
- Other unethical or unprofessional behavior.

Student Professional Organizations

Paper and Bioprocess Engineering Club

Students in the PBE department are encouraged to join the Paper and Bioprocess Engineering Club. This is an umbrella organization, under which two professional organizations of the paper industry, Paper Industry Management Association (PIMA) and Technical Association of the Pulp and Paper Industry (TAPPI), operate. All students are encouraged to join. The basic goal of the club is to contribute to the Paper Science and Engineering curriculum and to help introduce students to various aspects of the pulp and paper industry. Students are introduced to PIMA and TAPPI soon after their arrival at the College of Environmental Science and Forestry. In becoming PIMA and TAPPI members, students will receive several benefits both of the organizations: magazines, invitations to conferences and trade shows at student discount prices (usually FREE!) and the opportunity to gain vital contacts with people in the pulp and paper industry.

Membership is free to all undergraduate, matriculated, fee-paying (the student fee, part of your tuition) students at the College of Environmental Science and Forestry. Activities are understandably geared towards those students enrolled in the PBE department. Meetings are usually held monthly, with the exception of during summer and winter breaks. More meetings are sometimes necessary for fundraisers, planning trips to conferences, and planning club activities. Outside speakers are often invited to meetings to share information on such topics as new developments in the paper industry, career opportunities, and financial planning.

In addition, the club holds a Welcome/Welcome Back Party every semester to allow faculty, staff, and students time to meet and get to know the new freshmen and transfer students outside the classroom. Fundraising events are also held, and all are encouraged to participate. These fundraisers contribute to the Welcome/Welcome Back Party each semester, food for meetings, trips to TAPPI and PIMA conferences and trade shows and much more.

Finally, the PBE club tries to plan a few trips to conferences and trade shows each year. These are held in many different places throughout the United States and Canada. In the past, students have attended meetings in Saratoga Springs, Atlanta, New Orleans, Nashville, Virginia, and Montreal. Typical trips include a spring trip to the conference and trade show put on by Empire State TAPPI in Saratoga Springs. Every three years, the national TAPPI organization holds a large trade show in Atlanta, Georgia, that brings together companies from around the world. These conferences and trade shows are excellent opportunities for students to begin creating their “network” and developing industry awareness which will be invaluable during interviewing and subsequently in their careers.

As a student run organization, there are several opportunities for leadership roles. Officer positions include: President, Vice President, Secretary, and Treasurer. A list of current officers is given in the appendix.

AICHE Club

The AIChE ESF student chapter is a club that explores different ways that chemical engineering and chemistry can be applied after graduation. It is an excellent way to expand your knowledge about the chemical engineering industries as well as to work with peers on projects such as ChemE Car. All students of PBE as well as anyone interested in chemistry are encouraged to join AIChE.

The AIChE website is: https://www.aiche.org/. An example of the activities of one of their active chapters can be seen at https://www.aiche.org/chenected/2018/07/sister-chapter-spotlight-august-2018.

Syracuse Pulp and Paper Foundation

The Syracuse Pulp and Paper Foundation was established in 1960 to encourage young people to enroll in Paper Science and Paper Engineering at State University of New York College of Environmental Science and Forestry. The idea came from alumni and paper industry executives who wanted to keep a steady supply of good, talented, well-trained engineers coming into the industry. They thought the best way to do that was to offer scholarships to deserving students. The PSE program has enjoyed generous support from industry ever since. Through the SPPF, the pulp, paper and allied industries make an investment in the students and their futures, which is one of the things that really sets this program apart from others.

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

Since its establishment, the SPPF has distributed nearly $4 million in scholarships to undergraduates. The average annual budget for scholarships and student support is approximately $100,000. Scholarships are supported by annual contributions from companies and from alumni and friends, and by income from the scholarship endowment investment fund of $4 million.

In addition to scholarships, the SPPF and its members provide other support for the students and Department of PBE. SPPF members contributed some $260,000 in equipment for the first of its kind Environmental Engineering Laboratory, a $370,000 micro-scale plant dedicated for research and education in wastewater treatment and wastepaper recycling. Each October the SPPF holds its annual meeting, giving students the opportunity to interact with industry executives and to attend a seminar on an issue important to the paper industry. Also, the Foundation arranges for guest lectures in classes and special programs, and the SPPF sponsors the PBE orientation and participates in the annual event. Foundation staff members work with recruiters and students to ensure high rates of job placement for summer interns, co-ops and permanent positions.

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

SPPF Paper Engineering Scholarships

The Syracuse Pulp and Paper Foundation, Inc. (SPPF) awards scholarships to undergraduate students enrolled in Paper Engineering at the SUNY College of Environmental Science and Forestry. SPPF scholarships are based on academic merit, and awards vary based on cumulative grade point average. Scholarships are renewed each semester subject to the approval of the SPPF Board of Directors.

The following eligibility requirements and restrictions apply to students that have entered the Paper programs since Fall 2011.

1. Students must be enrolled in the Paper Engineering program at the SUNY College of Environmental Science and Forestry and demonstrate satisfactory progress toward a BS degree in Paper Engineering as defined by the Department in consultation with the SPPF Scholarship Committee and Board of Directors.

2. Scholarships are available to US citizens and permanent residents. Others may be considered at the discretion of the Foundation depending on availability of funds. The SUNY ESF Director of Business Affairs determines residency.

3. Award Schedule

   a) Freshmen and transfer freshmen students while in their first year at the Paper and Bioprocess Engineering Department, SUNY ESF, in Paper Engineering will receive $500.
   b) Year two at Paper and Bioprocess Engineering Department and transfer sophomores, who carry a GPA of 2.0 or above, will receive $3,200 per semester for two semesters.
   c) Years three and plus: for continuing and transfer students, scholarships are awarded on a semester-by-semester basis according to Table 2. Initial awards for transfer (junior and senior) students will be based on the final cumulative GPA from the point of transfer.

Table 2. SPPF award schedule for students at Paper and Bioprocess Engineering in of Paper Engineering for at least three years or for transfer junior and up students.

GPA	NYS Residents	Out-of-state students
3.250 - 4	$3,200	$3,950
3.000 - 3.249	$2,350	$3,100
2.500 - 2.999	$1,730	$2,480

   d) For students enrolled less than full time, schedules a) through c) apply on a prorated basis.

Please note *that the scholarship program may be changed per the recommendation of the Foundation's Scholarship Committee and the approval of the SPPF Board of Directors.*

Awards may vary from semester to semester according to available resources.

SPPF Paper Science Minor Scholarship

The Syracuse Pulp and Paper Foundation, Inc. (SPPF) offers scholarships to undergraduate students enrolled in the Paper Science Minor in the Department of Paper and Bioprocess Engineering at SUNY College of Environmental Science and Forestry. SPPF scholarships are available by application (an application form is included in Appendix H) based on academic merit, and awards vary based on cumulative grade point average (GPA) and course grades. Scholarships are renewed each semester, subject to Scholarship Committee approval.

The following eligibility requirements and restrictions are currently in effect for students entering the program:

1. Enrollment in the appropriate program and minor in the Department of Paper and Bioprocess Engineering the at SUNY College of Environmental Science and Forestry and satisfactory progress toward a BS degree and minor as defined by the Department of Paper and Bioprocess Engineering in consultation with the SPPF Scholarship Committee and SPPF Board of Directors.

2. Scholarships are available to US citizens and permanent residents. Others may be considered at the discretion of the Foundation depending on availability of funds. The SUNY-ESF Director of Business Affairs determines immigration status.

3. The award is accrued as selected courses (Table 3) are completed with a grade of B- or higher on a $200/credit basis. Disbursements are made to the bursar following the completion of the academic year. Students must maintain a cumulative GPA of 2.5 to receive the scholarship award.

Table 3. Eligible Courses for an SPPF Award

Course Name	Course number	Dollar amount
Introduction to Papermaking	PSE 200	$600
Pulp and Paper Laboratory Skills	PSE 202	200
Fiber Processing	PSE 350	900
Equipment Troubleshooting & Maintenance	PSE 437	900
Pulping and Bleaching Processes	PSE 450	900
Fiber and Paper Properties	PSE 465	900
Paper Pigment and Barrier Coating	PSE 466	900
Papermaking Wet End Chemistry	PSE 467	900
Papermaking Processes	PSE 468	900

Please note *that the scholarship program may be changed per the recommendation of the Foundation's Scholarship Committee and the approval of the SPPF Board of Directors. Awards may vary from semester to semester according to available resources.*

SPPF Management Minor Scholarship

The Syracuse Pulp and Paper Foundation, Inc. (SPPF) through the Joachim Endowment offers scholarships to undergraduate students enrolled in the Management Minors (Entrepreneurship

Minor, General Management Studies Minor, and Marketing Minor) in the Department of Paper and Bioprocess Engineering at SUNY College of Environmental Science and Forestry. Students majoring in Paper Engineering or Bioprocess Engineering are eligible for this scholarship. SPPF scholarships are available by application (Application form is shown in Appendix H) based on academic merit, and awards vary based on cumulative grade point average (GPA) and course grades. Scholarships are renewed each semester subject to Scholarship Committee approval.

The following eligibility requirements and restrictions are currently in effect for students entering the program after Fall 2009:

1. Enrollment in the appropriate program and minor in the Department of Paper and Bioprocess Engineering the at SUNY College of Environmental Science and Forestry and satisfactory progress toward a BS degree and minor as defined by the Department of Paper and Bioprocess Engineering in consultation with the SPPF Scholarship Committee and SPPF Board of Directors.

2. Scholarships are available to US citizens and permanent residents. Others may be considered at the discretion of the Foundation depending on availability of funds. The SUNY-ESF Director of Business Affairs determines immigration status.
3. The award is accrued as courses are completed that satisfy the minor requirements, up to 5 courses. Disbursements are made to the bursar at the end of the academic year. Students must maintain a cumulative GPA of 2.5 to receive the scholarship award.

4. The maximum total award is $1,500.

Table 4. AWARD PER COURSE COMPLETED

Course Grade	Award
A, A-	$300
B+, B, B-	$200

Please note *that the scholarship program may be changed per the recommendation of the Foundation's Scholarship Committee and the approval of the SPPF Board of Directors. Awards may vary from semester to semester according to available resources.*

Bioprocess Engineering Scholarship

Jesse and Betsy Fink award - $500 annually

Send your application (one to two paragraphs) stating why you deserve the award to Dr. Shijie Liu at sliu@esf.edu before February 1 for full consideration.

Appendices

A. Academic Calendar

B. Sample Curricula
   - Bioprocess Engineering Program
   - Paper Engineering Program
   - Renewable Materials Science Program

C. On Campus Recruiting: Policies and Procedures

D. Guidelines for Summer Industrial and Co-op Experiences

E. Key PBE Faculty, Staff, AIChE Club and PBE Club Officers

F. Student Affairs Services

G. Sample Forms
   - Interview Information Form
   - BPE 304 / BPE 305 / PSE 304 / PSE 305 Registration Sheet
   - S.C.O.R.E. Form
   - Petition Form
   - SPPF Minor Award Applications

H. FE Exam Subject Matter

I. Code of Ethics for Engineers

Appendix A. Academic Calendar 2018-2019

Fall 2018

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

Spring 2019

Classes Begin	January 14, Monday
Martin Luther King Day - no classes	January 21, Monday
Last day to add a class	January 22, Tuesday
Last day to drop a class	February 8, Friday
Spring break	March 10-17, Sunday-Sunday
Last day to withdraw from a class with a grade of W	March 19, Tuesday
Registration for Fall 2019	April 8-May 8, Monday-Wednesday
Last day to withdraw from a class with a grade of W or WF	April 19, Friday
Last day of classes	April 30, Tuesday

Reading Day	May 1, Wednesday
Final exams	May 2-3, Thursday-Friday
Reading Days	May 4-5, Saturday-Sunday
Final exams	May 6-8, Monday-Wednesday
ESF May Commencement	May 11, Saturday
ESF/SU Joint Commencement	May 12, Sunday
Grades Due	May 15, Wednesday

Appendix B. Sample Curricula

Bioprocess Engineering

Fall

Freshman

Cat	No.	Title	cr
FCH	150	General Chemistry Lecture I	3
FCH	151	General Chemistry Lab I	1
PHY	211	General Physics I	3
PHY	221	General Physics I Lab	1
APM	205	Calculus I	4
EWP	190	Writing and the Environment	3
BPE	132	Introduction to Process Engineering I	1
			∑ 16.0

Sophomore

Cat	No.	Title	cr
FCH	221	Organic Chemistry Lab I	3
FCH	222	Organic Chemistry Lab I	1
APM	307	Calculus III	4
FCH	360	Physical Chemistry	3
PSE	370	Principles of Mass and Energy Balances	3
BPE	300	Introduction to Bioprocessing	3
GNE	330	Professional Engineering Skills	0.5
			∑ 17.5

Junior

444

Cat	No.	Title	cr
PSE	371	Fluid Mechanics	3
APM	395	Probability and Statistics for Engineers	3
FOR	207	Introduction to Economics	3
EWP	444	Writing for Science Professionals	2
ESF	200	Information to Literacy	1
		General Education	3
GNE	330	Professional Engineering Skills	0.5
			∑ 15.5

Senior

Cat	No.	Title	cr
BPE	435	Unit Process Operation	3
BPE	430	Process Operation Laboratory	3
PSE	477	Process Control	3
BPE	421	Bioprocess Kinetics and Systems Eng.	3
BPE	420	Bioseparations	3
PSE	304	Professional Experience/Synthesis	2
GNE	330	Professional Engineering Skills	0.5
			∑ 17.5

Spring

Freshman

Cat	No.	Title	cr
FCH	152	General Chemistry Lecture II	3
FCH	153	General Chemistry Lab II	1
PHY	212	General Physics II	3
PHY	222	General Physics Lab II	1
APM	206	Calculus II	4
EFB	103	General Biology II: Cell Biology & Genetics	3
EFB	104	General Biology II: Laboratory	1
BPE	133	Introduction to Process Engineering II	1
			∑ 17.0

Sophomore

Cat	No.	Title	cr
PSE	223	Intro to Lignocellulosics or	
		FCH 223/224Organic Chemistry II with Lab	4
PSE	361	Engineering Thermodynamics	3
APM	485	Differential Equations	3
EWP	290	Writing, Humanities and the Environment	3
GNE	160	Computing Methods	3
GNE	330	Professional Engineering Skills	0.5
			∑ 16.5

Junior

Cat	No.	Title	cr
BPE	335	Transport Phenomena	3
PSE	480	Engineering Design Economics	3
BPE	310	Colloid Interface Science	3
		Directed Elective	3
		General Education	3
GNE	330	Professional Engineering Skills	0.5
			∑ 15.5

Senior

Cat	No.	Title	cr
BPE	481	Bioprocess Engineering Design	3
BPE	440	Bioprocess and Systems Laboratory	3
		Directed Elective	3
		Directed Elective	3
GNE	330	Professional Engineering Skills	0.5
			∑ 12.5

Total Program Credits	**128**
Directed Electives	**9**
Total electives	**9**

Paper Engineering

Fall

Freshman

Cat	No.	Title	cr
FCH	150	General Chemistry Lecture I	3
FCH	151	General Chemistry Lab I	1
PHY	211	General Physics I	3
PHY	221	General Physics I Lab	1
APM	205	Calculus I	4
EWP	190	Writing and the Environment	3
PSE	132	Introduction to Process Engineering I	1
			∑ 16.0

Sophomore

Cat	No.	Title	cr
FCH	221	Organic Chemistry Lab I	3
FCH	222	Organic Chemistry Lab I	1
APM	307	Calculus III	4
FCH	360	Physical Chemistry	3
PSE	370	Principles of Mass and Energy Balances	3
PSE	200	Intro to Papermaking	3
PSE	202	Pulp and Paper Laboratory Skills	1
GNE	330	Professional Engineering Skills	0.5
			∑ 18.5

Junior

Cat	No.	Title	cr
PSE	371	Fluid Mechanics	3
APM	395	Probability and Statistics for Engineers	3
FOR	207	Introduction to Economics	3
EWP	407	Writing for Science Professionals	2
ESF	200	Information to Literacy	1
PSE	465	Fiber & Paper Properties	3
GNE	330	Professional Engineering Skills	0.5
			∑ 15.5

Senior

Cat	No.	Title	cr
BPE	435	Unit Process Operation	3
BPE	430	Process Operation Laboratory	3
PSE	477	Process Control	3
PSE	481	Engineering Design	3
		Directed Elective	3
PSE	304	Professional Experience/Synthesis	2
GNE	330	Professional Engineering Skills	0.5
			∑ 17.5

Spring

Freshman

Cat	No.	Title	cr
FCH	152	General Chemistry Lecture II	3
FCH	153	General Chemistry Lab II	1
PHY	212	General Physics II	3
PHY	222	General Physics Lab II	1
APM	206	Calculus II	4
PSE	201	The Art and early History of Papermaking	3
PSE	133	Introduction to Process Engineering II	1
			∑ 16.0

Sophomore

Cat	No.	Title	cr
PSE	223	Intro to Lignocellulosics or	
		FCH 223/224Organic Chemistry II with Lab	4
PSE	361	Engineering Thermodynamics	3
APM	485	Differential Equations	3
EWP	290	Writing, Humanities and the Environment	3
GNE	160	Computing Methods	3
GNE	330	Professional Engineering Skills	0.5
			∑ 16.5

Junior

Cat	No.	Title	cr
BPE	335	Transport Phenomena	3
PSE	480	Engineering Design Economics	3
PSE	467	Wet End Chemistry	3
PSE	350	Fiber Processing	3
		General Education	3
GNE	330	Professional Engineering Skills	0.5
			∑ 15.5

Senior

Cat	No.	Title	cr
PSE	468	Papermaking Processes	6
		Directed Elective	3
		Directed Elective	3
GNE	330	Professional Engineering Skills	0.5
			∑ 12.5

Total Program Credits	**128**
Direct Electives	**9**
Total electives	**9**

Renewable Materials Science

Fall

Freshman

Cat	No.	Title	cr
FCH	150	General Chemistry Lecture I	3
FCH	151	General Chemistry Lab I	1
PHY	211	General Physics I	3
PHY	221	General Physics I Lab	1
APM	205	Calculus I	4
EWP	190	Writing and the Environment	3
PSE	132	Introduction to Process Engineering I	1
			∑ 16.0

Sophomore

Cat	No.	Title	cr
FCH	221	Organic Chemistry Lab I	3
FCH	222	Organic Chemistry Lab I	1
APM	307	Calculus III	4
FCH	360	Physical Chemistry	3
PSE	370	Principles of Mass and Energy Balance	3
PSE	200	Intro to Papermaking	3
PSE	202	Pulp and Paper Laboratory Skills	1
GNE	330	Professional Engineering Skills	0.5
			∑ 18.5

Junior

Cat	No.	Title	cr
PSE	371	Fluid Mechanics	3
APM	395	Probability and Statistics for Engineers	3
FOR	207	Introduction to Economics	3
EWP	407	Writing for Science Professionals	2
ESF	200	Information to Literacy	1
PSE	465	Fiber & Paper Properties	3
GNE	330	Professional Engineering Skills	0.5
			∑ 15.5

Senior

Cat	No.	Title	cr
BPE	435	Unit Process Operation	3
BPE	430	Process Operation Laboratory	3
PSE	477	Process Control	3
PSE	481	Engineering Design	3
		Directed Elective	3
PSE	304	Professional Experience/Synthesis	2
GNE	330	Professional Engineering Skills	0.5
			∑ 17.5

Spring

Freshman

Cat	No.	Title	cr
FCH	152	General Chemistry Lecture II	3
FCH	153	General Chemistry Lab II	1
PHY	212	General Physics II	3
PHY	222	General Physics Lab II	1
APM	206	Calculus II	4
PSE	201	The Art and early History of Papermaking	3
PSE	133	Introduction to Process Engineering II	1
			∑ 16.0

Sophomore

Cat	No.	Title	cr
PSE	223	Intro to Lignocellulosics or	
		FCH223/224 Organic Chemistry II with Lab	4
PSE	361	Engineering Thermodynamics	3
APM	485	Differential Equations	3
EWP	290	Writing, Humanities and the Environment	3
GNE	160	Computing Methods	3
GNE	330	Professional Engineering Skills	0.5
			∑ 16.5

Junior

Cat	No.	Title	cr
BPE	335	Transport Phenomena	3
PSE	480	Engineering Design Economics	3
PSE	467	Wet End Chemistry	3
PSE	350	Fiber Processing	3
		General Education	3
GNE	330	Professional Engineering Skills	0.5
			∑ 15.5

Senior

Cat	No.	Title	cr
PSE	468	Papermaking Processes	6
		Directed Elective	3
		Directed Elective	3
GNE	330	Professional Engineering Skills	0.5
			∑ 12.5

	Total Program Credits	**128**
	Direct Electives	**9**
	Total electives	**9**

Appendix C: On-Campus Recruiting

POLICIES AND PROCEDURES
FOR
PERMANENT PLACEMENT, SUMMER INTERNSHIPS
AND CO-OPS

I. RESUMES

A. Submit 25 copies of your resume to the PBE Office by September 20. A resume writing workshop will be held early in the semester.
Note: Each student has a file in the cabinet in 205 Walters. Multiple copies are needed for companies coming to campus and others that request resumes for consideration.

B. Resumes must be approved by the ESF Career Services office, Dr. Shijie Liu, Dr. Gary Scott, or Ms. Linda Fagan before they are placed in the student file folder.

C. Check your file periodically to make sure there are sufficient copies.

D. Take one resume to the Career Services office.

II. INTERVIEW SCHEDULES

A. Sign-up sheets will be posted on the bulletin board in Walters Hall. They will remain up for at least three days and then final schedules will be posted

B. Once the sign up is removed from the bulletin board, any changes must be made through the PBE office or the SPPF office.

C. DO NOT write your name in on a final schedule; that will not guarantee you an interview. If you want to add your name to a schedule, you must do so through the PBE office or SPPF Office.

D. When the final schedule is posted, it means that it the resumes have already been sent to the company for pre-screening. *Frequently double-check your interview time, especially the morning of the interview. It is sometimes necessary to change interview times due to the travel plans of the recruiter. While we will try to contact you if there is a change, it is your responsibility to verify the time.*

E. If your resume is not on file when it is time to send them to the company, your name will be removed from the list, and <u>you will not be allowed to interview</u>. *Note: Some companies want the resumes two weeks ahead of time, so turning one in a few days prior to the interview day is not acceptable.*

F. If for some reason you need to change your interview time, it will be your responsibility to speak with the recruiter at the evening program. *If the recruiter is agreeable to the change, it is your responsibility to let the PBE office know first thing in the morning.*

G. If you miss an interview, you will need to call the recruiter and write a letter to apologize. You will not be allowed to interview on campus until this is done. If you are already signed up interviews, your name will be removed from the schedule.

III. EVENING PROGRAMS

A. The schedules for evening programs will be posted on the bulletin board. It will be revised as companies are added or if they need to cancel or postpone. Therefore, students must check the list frequently for any additions or changes.

B. All evening programs are in 210 or 211 Walters Hall. The typical time is 6:30 pm. However, that is not the rule. Check the schedule to verify time.

C. It is to your benefit to attend the evening program--especially if you are going to be interviewing with the company. *If you are interviewing with the company, many recruiters expect you to be at the program.*

IV. LITERATURE AND VIDEOS

A. A list of videos that are available on companies is posted on the bulletin board. The videos are located in the PBE Office, room 205.

B. If the company sends literature it is placed in two places:

1. In the PBE office
2. In the magazine rack outside the classrooms on the second floor

C. Again, you are strongly advised to familiarize yourself with companies within the industry.

Appendix D. Guidelines for Summer Industrial and Co-op Experiences

Bioprocess Engineering Work Experiences
BPE 304: Summer Internship (2 credits)
BPE 305: BPE Co-op Experience (2 credits)

Paper Science and Engineering Work Experiences
PSE 304: Summer Mill Internship (2 credits)
PSE 305: PSE Co-op Experience (2 credits)

GENERAL REQUIREMENTS

Each student will normally complete the requirements of BPE 304 or PSE 304 after their Junior year. The period of employment must be at least 12 weeks in order to receive credit for BPE 304 or PSE 304. A Co-op experience generally extends the work period into the adjacent spring or fall semester making the entire work experience 7 months long. Both Summer Internship (BPE 304 or PSE 304) and Co-op Experience (BPE 305, PSE 305) give students the opportunity to gain valuable work experience while exploring different career choices.

The student's grade for each of these classes will depend on three main factors including a written report, evaluations by the student's supervisor, and a short presentation given upon return to campus. The guidelines for the report are given on a separate sheet. In general, the report from the Summer Internship (BPE 304 or PSE 304) focuses on the company at which the student works. In contrast, the report from the Co-op Experience (BPE 305 or PSE 305) covers the tasks or problems that the student was assigned to. Reports are due by the fourth week of classes after returning to campus.

With the information given on the registration form, evaluation forms will be periodically sent to the student's supervisor at the company near the end of each work period. It is the student's responsibility to see that the forms are filled out and returned. Students for which no evaluation forms are returned will be solely graded on the report and the presentation given.

The student will give a presentation upon returning to campus. The presentation will be 5-10 minutes in length and be given to prospective students that will be going out on their summer or Co-op experience in the following year. The presentation should briefly describe the mill, the work that was done, what was learned from the experience, and advice to students going out on their first work experience. These presentations will be done within the first half of the semester upon returning.

Since final grades for BPE 304, BPE 305, PSE 304 and PSE 305 cannot be given until the report is completed and the presentations given upon return, a tentative grade based on the employer evaluations or incomplete may be given at the end of each grading period. This is done with the understanding that these grades will change upon

completion of all the requirements for the course. All of the requirements must be met in order to receive a passing grade.

The student should remain aware that the mill is extending a favor in allowing this experience. The student's conduct at the mill should reflect this awareness. All students are expected to fulfill the commitment that they made at the beginning of the work period with regard to its length, working hours, and job responsibilities. Students not fulfilling their commitment risk losing the privilege of participating in on campus interviews for subsequent summer and Co-op positions, as well as permanent positions. ESF will not help place students that are not responsible with companies that come to interview.

Bioprocess Engineering Work Experiences
BPE 304: Summer Internship (2 credits)
BSE 305: BPE Co-op Experience (2 credits)

Paper Science and Engineering Work Experiences
PSE 304: Summer Mill Internship (2 credits)
PSE 305: PSE Co-op Experience (2 credits)

GENERAL REPORT REQUIREMENTS

The report must be typewritten on 8½ × 11" paper, and bound in a three-ring binder. It should include a photograph of the author, details of the dates and location of employment, and the name of the student's supervisor. It is important to respect the confidentiality of privileged information. The report should be approved for release by the student's supervisor prior to being submitted for grading. The report is due by the end of the fourth week of classes upon returning to campus. It is the students' responsibility to assure that enough time is allowed for this review by the employer before the due date. Each hour of credit for the class is expected to represent 45 hours of work during the course of the summer or semester. Thus the preparation of the report and the presentation for the summer report should be about 90 hours of work. The student is encouraged to be writing the report throughout the summer and not try to put together the report the week before it is due.

The length of the report will vary with the work situation, but excessive detail is discouraged. The student is urged to use drawings, photographs, pictorial materials, and a reasonable number of product samples when they are available. For each section of the report, page limits are given below. Additional supporting information, including product samples, can be placed in the appendix. The student should prepare a duplicate copy for his own use if they wish to have one.

The reports will be graded on the basis of content (50%), organization (25%), and style (25%). For content the report should present a clear overview, have an appropriate title, logically and clearly present the information, fulfill the assignment, and reflect the writer's viewpoint. For organization, the report should open with an introduction, develop

the topics logically in ordered paragraphs, interpret as well as present the data, include transitions between ideas, and provide factual and visual supplements as necessary. For style, the report should be written using an appropriate tone and vocabulary, in sentences that are clear, concise, and fluent, and be without errors in spelling, usage, grammar, and punctuation.

The contents for the two reports are different for the Summer Internship (BPE 304 or PSE 304) and the Co-op Experience (BPE 305 or PSE 305). The specific content is described in the following outlines.

SUMMER INDUSTRIAL INTERSHIP REPORT (BPE 304 or PSE 304)

The report for the summer internship should describe the entire plant site or company and the relationship of the student's position to the company. The report must demonstrate an understanding of the operation of the plant site or company, including the raw material supply, the product made or sold, and the market served. The body of the written report should be concise and well-written, with additional supporting material placed in the appendix. All supporting material in the appendix should be referenced somewhere in the text of the report. The report should be organized as given below and address the specific points given:

For those working at a mill site:

1. **History.** A brief history of the mill (1-3 pages).
2. **Products.** A description of the product line of the mill (1-3 pages).
3. **Customers.** A description of the markets served by the mill's products (1-3 pages).
4. **Plant Site Processes.** A description of each of the major processes at the plant site. A major process is the woodyard, pulp mill, bleach plant, paper machine, etc. Process flow diagrams should be included in the appendix (1-3 pages for each process).
5. **Departmental Organization.** The organization of the department in which the student worked and its relationship to other departments at the plant site (1-3 pages).
6. **Economic Analysis.** An economic analysis of the operation of the mill and its future profitability (1-3 pages).
7. **Work Performed.** The work performed by the student including technical data (if relevant). Any reports prepared by the student may be included in the appendix if approved by the mill for inclusion in the student's summer report. The format described in parts 2 and 3 of the PSE 305 report should be used (1-3 pages).
8. **Student Evaluation.** The student's evaluation of his experience (1-3 pages).

For those working with a supplier:

1. **History.** A brief history of the company (1-3 pages).
2. **Products.** A description of the product line and/or service of the company (1-3 pages should be devoted to each major product or service).
3. **Customers.** A description of the customers served by the company (1-3 pages).
4. **Departmental Organization.** The organization of the department in which the student worked and its relationship to other departments in the company (1-3 pages).
5. **Economic Analysis.** An economic analysis of the operation of the company and its future profitability (1-3 pages).
6. **Work Performed.** The work performed by the student including technical data (if relevant). Any reports prepared by the student may be included in the appendix if

approved by the company for inclusion in the student's summer report. The format described in parts 2 and 3 of the PSE 305 report should be used (1-3 pages).

7. **Student Evaluation.** The student's evaluation of his experience (1-3 pages).
8. CO-OP EXPERIENCE REPORT (BPE 305 or PSE 305)

The report for the Co-op experience should concentrate on a particular problem or task that the student was assigned. One report should be handed in for each work period involved in the co-op experience. Specifically, the report should cover the following points using the following format:

1. **Company background material** (1-3 pages)
   a. History of the company.
   b. Products produced/Services provided.
   c. Customers of the company.
2. **Assigned problem** (1-2 pages). A person reading this section of the report should be able to understand the problem, the steps that were taken to solve the problem, and the recommendations. This section should be divided into three parts.
   a. Summary of the problem to be solved.
   b. Conclusions based on the experimental evaluation.
   c. Recommendations based on experimental evaluation.
3. **Discussion of the problem.** This section contains greater detail with regards to the background to the problem, past work that has been done on the problem, the procedures used to solve the problem, and a detailed discussion of the results (1-5 pages)
   a. Background of the problem to be solved.
   b. Experimental Procedures used to solve the problem.
   c. Results obtained from the experiments or trials.
4. **Appendix.** The appendix should contain the formulae used in calculations, graphs, tables, and additional supporting material (1-20 pages).
5. **Student Evaluation.** The student’s evaluation of the experience (1-2 pages).

Appendix E. PBE Faculty, Staff, AIChE Club and PBE Club Officers

Faculty Member	Office	Phone Number	Email
Dr. Thomas E. Amidon	321 Walters	470-6524	teamidon@esf.edu
PSE 456: Management in the paper industry			
Dr. Susan E. Anagnost	204 Baker	470-6837	seanagno@esf.edu
Dr. Biljana Bujanovic	419 Walters	470-6907	bbujanovic@esf.edu
PSE 223 Introduction to Lignocellulosics			
PSE 465 Paper properties			
PSE 466 Paper coating / converting			
PSE 438 Fibrous Materials			
BPE 335 Transport Phenomena			
Mr. William Burry	307 Walters	470-4779	wmburry@syr.edu
PSE 201: Art & Early History of Papermaking			
PSE 202: Laboratory skills			
PSE 351: Pulping and bleaching laboratory			
Dr. Siddharth Chatterjee	406 Walters	470-6517	schatterjee@esf.edu
APM 485: Differential Equations			
BPE, PSE 304/5: Summer/Co-op experience			
GNE 461: Air pollution engineering			
PSE 480: Engineering design economics			
PSE 481: Engineering design			
BPE 435: Bioprocess Unit Operations			
Dr. Klaus Doelle	416 Walters	470-6531	kdoelle@esf.edu
PSE 200: Introduction to pulp and paper			
PSE 437 Equipment Trouble Shooting			
PSE 468: Papermaking processes			
PSE 492 Research Practice			
PSE 552 Recycling			
Dr. Raymond C. Francis	311 Walters	470-6525	francis@syr.edu
PSE 436: Unit Operations			
BPE 300 Introduction to Industrial Bioprocessing			
Dr. Rafaat M. Hussein	216 Baker	470-6833	rmhussei@esf.edu
Dr. Shijie Liu	302 Walters	470-6885	sliu@esf.edu
BPE 300 Introduction to Industrial Bioprocessing			
BPE 336 Transport Phenomena Lab			
BPE 421 Bioprocess Kinetics and Systems Eng.			
BPE 440 Bioprocess and Systems Lab			
BPE 438 Introduction to Biorefinery Processes			
Dr. Robert W. Meyer	101 Baker	470-6838	rwmeyer@esf.edu
Dr. Bandaru V. Ramarao, *Interim chair Associate Director, ESPRI*	310 Walters	470-6513	bvramara@syr.edu
BPE 310: Colloid and Interface Science			
BPE 420 Bioseparations			
PSE 371: Fluid mechanics			
PSE 467: Wet end chemistry			
PSE 469 Functional and Nano Additives			
Dr. Gary M. Scott	205 Walters	470-6501	gscott@esf.edu
GNE 160: Computing Methods			
GNE 330: Professional Skills Seminars			
BPE/PSE 132: Orientation			
PSE 370: Principles of mass and energy balances			
Dr. William B. Smith	218 Baker	470-6832	wbsmith@esf.edu
Dr. Chang Geun Yoo	409 Walters	470-6516	cyoo05@esf.edu

Staff Member	Office	Phone Number	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
Syracuse Pulp and Paper Foundation		470-6532	SPPF@esf.edu
Mr. Sean M. Hohm *Instructional Support Technician*	416 Walters	470-6587	smhohm@esf.edu
Dr. Sergiy Lavrykov *Research Scientist*	409 Walters	470-6516	lavrykov@esf.edu
Ms. Lynn C. Mickinkle *PBE Department Secretary*	205 Walters	470-6501	lcmickin@esf.edu
Ms. E. Kelly Watson-Collins *Instructional Support Technician*	102 Walters	470-6532	ekwatson@esf.edu
Mr. George R. Westby *Instructional Support Technician*	416 Walters	470-4952	grwestby@esf.edu

AIChE Club		Phone Number	Email
Hannah Laffend	*President*		hlaffend@syr.edu
Peter Scala	*Vice President*		prscala@syr.edu
Jake Konecny	*Treasurer*		jjkonecn@syr.edu
Matthew Washburn	*Secretary*		mbwashu@syr.edu
Nick Panico	*Technical Director*		njpanico@syr.edu
Mat Ovadias	*Senior Advisor*		mjovdia@syr.edu

PBE Club		Phone Number	Email
William Lawrence	*President*		wtlawren@syr.edu
Emily Parsons	*Vice President*		eeparson@syr.edu
Janessa Sandoval	*Treasurer*		jasando@syr.edu
Nicholas Panico	*Secretary*		njpanico@syr.edu

Appendix F Student Affairs Services—Division of Student Affairs Staff Directory

Dean's Office 110 Bray Hall, 315-470-6660

Anne E. Lombard, Ph.D.
Vice Provost and Dean for Student Affairs
110 Bray Hall
aelombard@esf.edu
x6660

Mary T. Triano
Senior Assistant Dean for Student Affairs
110 Bray Hall
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x6660

Anthony P. Chefalo
Coordinator of Student Conduct
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x6660

Jennifer Shaw
OVW Grant Project Coordinator
222 Baker Lab
jrshaw03@esf.edu

Megan Thurston
Secretary II, Student Affairs
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x6660

Lauren Becksted
Office Assistant II, Student Affairs
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x6660

Athletics

Dan Ramin
Director of Intercollegiate Athletics
10 Bray Hall
dwramin@esf.edu
x4933

Career Services / Academic Support

John E. Turbeville, Ph.D.
Senior Assistant Dean for Student Affairs/Director of Career Services
Old Greenhouse
jturbev@esf.edu
x6900

Casey Duffy
Career Advisor
110 Bray Hall
cduffy01@esf.edu
x6691

Jennifer Fazio
Applied Learning Coordinator
Old Greenhouse
jsfazio@esf.edu
x4754

Amelia Hoffman
Coordinator of Academic Support Services
110 Bray Hall
aghoffma@esf.edu
x4909

Sofia Hvozda
Secretary I, Athletics and Career Services
110 Bray Hall
shvozda@esf.edu
x6900

Counseling Services 105 Bray Hall, 315-470-4716

Ruth Larson
Director of Counseling Services
110 Bray Hall
rlarson@esf.edu
x4716

Roger Howard
Staff Therapist
110 Bray Hall
rdhoward@esf.edu
x4716

TBD
Staff Therapist
Bray Hall

Evelyn Piccoli
Office Assistant
110 Bray Hall
evpiccol@esf.edu
315-470-4716

Diversity and Inclusion / Underrepresented Student Support Programs

Eileen Baldassarre
CSTEP Coordinator
14 Bray Hall
ebaldassarre@esf.edu
x4895

Student Leadership and Involvement / Community Service

Laura Crandall
Director of Student Involvement and Leadership
110 Bray Hall
ldcranda@esf.edu
x6658

Sarah Houck
Coordinator of Student Involvement and Leadership
110 Bray Hall
sbhouck@esf.edu
X4903

Centennial Hall 142 Oakland Street, 315-741-3067

Kim Max
Community Manager
kamax@esf.edu

TBD
Assistant Community Manager

Mason Otero
Residence Director
motero@esf.edrtrust.com

Maddie Cleworth
Resident Services and Marketing Manager
rsmchsyracuse@edrtrust.edu

Appendix G: Sample Forms

The availability of the forms shown on the next several pages is given below. While the Interview Information Form, Technical Elective Form, and the PSE 304/305 Registration Form may be copied from this handbook and used, the other forms are multipart forms that need to be obtained from the location given below.

Form	Location
Interview Information Form	SPPF Office, 319 Walters Hall
PSE 304/305 Registration Form	Mr. Burry, 307 Walters Hall
Petition Form	Registrar's Office, 111 Bray Hall
S.C.O.R.E. Form	Registrar's Office, 111 Bray Hall

BPE 304 Summer Internship in Bioprocess Engineering
BPE 305 Co-op Experience

Student Information:

Name:	Class Standing:
Social Security Number:	Work Phone*:
Permanent Address: Street: City/State/Zip:	Work Address*: Street: City/State/Zip:
*This information should reflect where you can be contacted during your work experience.	

Employer Information:

Company:	Supervisor:
Address: Street: City/State/Zip:	Title:
Phone:	Fax:

Email:	Start Date:	Expected End Date:

Work Periods:	**Class Registration:**
⎦ Spring 20___	⎦ BPE 305 (2 credits)
⎦ Summer 20___	⎦ BPE 304 (2 credits)
⎦ Fall 20	⎦ BPE 305 (2 credits)
⎦ Spring 20	⎦ BPE 305 (2 credits)

PSE 304 Summer Mill Internship
PSE 305 Co-op Experience

Student Information:

Name:	Class Standing:
Social Security Number:	Work Phone*:
Permanent Address: Street: City/State/Zip:	Work Address*: Street: City/State/Zip:
*This information should reflect where you can be contacted during your work experience.	

Employer Information:

Company:	Supervisor:	
Address: Street: City/State/Zip:	Title:	
Phone:	Fax:	
Email:	Start Date:	Expected End Date:

Work Periods:	**Class Registration:**
⎦ Spring 20___	⎦ PSE 305 (2 credits)
⎦ Summer 20___	⎦ PSE 304 (2 credits)
⎦ Fall 20	⎦ PSE 305 (2 credits)
⎦ Spring 20	⎦ PSE 305 (2 credits)

Interview Information Form

Student Information:

Name:	Class Standing: Fr Soph Jr Sr
Social Security Number:	Type of Job: Summer Co-op Permanent
Address: Street: City/State/Zip:	Phone*: Email*:
*How you will be contacted in case of a last-minute change in the interview.	

Resume:

Before signing up for interviews, you must have copies of an approved resume on file. Attach the approved resume to this form and have the approving person sign below:

_____ _____

Approving Signature Date

Acknowledgement of Responsibility:

I acknowledge that I have read and understand the policies, procedures, and information regarding on-campus interviewing in the Department of Paper and Bioprocess Engineering that I have been given. I understand that violation of these policies will result in the loss of the privilege of participating in on-campus interviewing for summer, co-op, and permanent jobs.

_____ _____

Student Signature Date

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

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

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

Total Hours _____

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

_____ _____ _____

Student Signature Advisor / Major Professor Date

REGISTRAR COPY

SUNY COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY

Undergraduate Student
Degree Program _____
Class Level _____

Graduate Student
Degree Program _____
Degree Sought _____

PETITION TO THE FACULTY

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

Request:

Justification for Request:

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

_____
Signature Date

RECOMMENDATIONS

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

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

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

FINAL ACTION

Committee on Instruction/Dean, Instruction and Graduate Studies

Comments _____
Signature _____ Approved ____ _____
Date _____ Disapproved ____ _____

Recorded PRC ____ **CRT** ____

REGISTRAR

SYRACUSE PULP AND PAPER FOUNDATION SCHOLARSHIP APPLICATION
Paper Science Minor Scholarship
Management Minor Scholarship
Department of Paper and Bioprocess Engineering

Name:		Undergraduate Major:	☐ Paper Engineering ☐ Paper Science ☐ Bioprocess Engineering ☐ _____
Address:			
Email:		Expected Graduation Date:	
Phone:		GPA:	

A petition has been submitted to declare the following minor:

- ☐ Paper Science Minor
- ☐ Entrepreneurship Minor
- ☐ General Management Studies Minor
- ☐ Marketing Minor

By applying for this scholarship, I recognize that the selection committee will be reviewing my academic records and graduate application.

Signature _____ Date _____

To be eligible to receive this SPPF scholarship, you must petition to enroll in the minor at SUNY-ESF and be accepted into one of the minors listed above. Your scholarship application will be reviewed after you have been accepted.

Please submit the following information with this application:

1. Current resume.
2. Transcript (unofficial) of previous college-level work.
3. Statement of career goals and interest in the pulp and paper industry.
4. Two letters of recommendation.

Return completed application to: Ms. Linda Fagan, Administrative Manager
Syracuse Pulp and Paper Foundation
SUNY-ESF
One Forestry Drive
Syracuse, NY 13210

Appendix H: Fundamentals of Engineering (FE) Exam Subject Matter

CHEMICAL CBT Exam Specifications
Effective Beginning with the January 2014 Examinations

 The FE exam is a computer-based test (CBT). It is closed book with an electronic reference.

 Examinees have 6 hours to complete the exam, which contains 110 questions. The 6-hour time also includes a tutorial and an optional scheduled break.

 The FE exam uses both the International System of Units (SI) and the US Customary System (USCS).

Knowledge	Number of Questions
1. Mathematics	**8–12**
A. Analytic geometry	
B. Roots of equations	
C. Calculus	
D. Differential equations	
2. Probability and Statistics	**4–6**
A. Probability distributions (e.g., discrete, continuous, normal, binomial)	
B. Expected value (weighted average) in decision making	
C. Hypothesis testing	
D. Measures of central tendencies and dispersions (e.g., mean, mode, standard deviation)	
E. Estimation for a single mean (e.g., point, confidence intervals)	
F. Regression and curve fitting	
3. Engineering Sciences	**4–6**
A. Applications of vector analysis (e.g., statics)	
B. Basic dynamics (e.g., friction, force, mass, acceleration, momentum)	
C. Work, energy, and power (as applied to particles or rigid bodies)	
D. Electricity and current and voltage laws (e.g., charge, energy, current, voltage, power, Kirchhoff, Ohm)	
4. Computational Tools	**4–6**
A. Numerical methods and concepts (e.g., convergence, tolerance)	
B. Spreadsheets for chemical engineering calculations	
C. Simulators	
5. Materials Science	**4–6**
A. Chemical, electrical, mechanical, and physical properties (e.g., effect of temperature, pressure, stress, strain)	
B. Material types and compatibilities (e.g., engineered materials, ferrous and nonferrous metals)	
C. Corrosion mechanisms and control	
6. Chemistry	**8–12**
A. Inorganic chemistry (e.g., molarity, normality, molality, acids, bases, redox reactions, valence, solubility product, pH, pK, electrochemistry, periodic table)	
B. Organic chemistry (e.g., nomenclature, structure, qualitative and quantitative analyses, balanced equations, reactions, synthesis, basic biochemistry)	
7. Fluid Mechanics/Dynamics	**8–12**
A. Fluid properties	

B. Dimensionless numbers (e.g., Reynolds number)
C. Mechanical energy balance (e.g., pipes, valves, fittings, pressure losses across packed beds, pipe networks)
D. Bernoulli equation (hydrostatic pressure, velocity head)
E. Laminar and turbulent flow
F. Flow measurement (e.g., orifices, Venturi meters)
G. Pumps, turbines, and compressors
H. Compressible flow and non-Newtonian fluids

8. Thermodynamics **8–12**

A. Thermodynamic properties (e.g. specific volume, internal energy, enthalpy, entropy, free energy)
B. Properties data and phase diagrams (e.g. steam tables, psychrometric charts, T-s, P-h, x-y, T-x-y)
C. Thermodynamic laws (e.g., 1st law, 2nd law)
D. Thermodynamic processes (e.g., isothermal, adiabatic, isentropic)
E. Cyclic processes and efficiency (e.g., power, refrigeration, heat pump)
F. Phase equilibrium (e.g., fugacity, activity coefficient)
G. Chemical equilibrium
H. Heats of reaction and mixing

9. Material/Energy Balances **8–12**

A. Mass balance (steady and unsteady state)
B. Energy balance (steady and unsteady state)
C. Recycle/bypass processes
D. Reactive systems (e.g., combustion)

10. Heat Transfer **8–12**

A. Conductive heat transfer
B. Convective heat transfer (natural and forced)
C. Radiation heat transfer
D. Heat transfer coefficients (e.g., overall, local, fouling)
E. Heat transfer equipment, operation, and design (e.g., double pipe, shell and tube, fouling, number of transfer units, log-mean temperature difference, flow configuration)

11. Mass Transfer and Separation **8–12**

A. Molecular diffusion (e.g., steady and unsteady state, physical property estimation)
B. Convective mass transfer (e.g., mass transfer coefficient, eddy diffusion)
C. Separation systems (e.g., distillation, absorption, extraction, membrane processes)
D. Equilibrium stage methods (e.g., graphical methods, McCabe-Thiele, efficiency)
E. Continuous contact methods (e.g., number of transfer units, height equivalent to a theoretical plate, height of transfer unit, number of theoretical plates)
F. Humidification and drying

12. Chemical Reaction Engineering **8–12**

A. Reaction rates and order
B. Rate constant (e.g., Arrhenius function)
C. Conversion, yield, and selectivity
D. Type of reactions (e.g., series, parallel, forward, reverse, homogeneous, heterogeneous, catalysis, biocatalysis)
E. Reactor types (e.g., batch, semibatch, continuous stirred tank, plug flow, gas phase, liquid phase)

13. Process Design and Economics **8–12**

A. Process flow diagrams and piping and instrumentation diagrams
B. Equipment selection (e.g., sizing and scale-up)
C. Cost estimation
D. Comparison of economic alternatives (e.g., net present value, discounted cash flow, rate of return, expected value and risk)
E. Process design and optimization (e.g., sustainability, efficiency, green engineering, inherently safer design, evaluation of specifications)

14. Process Control **5–8**

A. Dynamics (e.g., time constants and 2nd order, underdamped, and transfer functions)
B. Control strategies (e.g., feedback, feed-forward, cascade, ratio, and PID)
C. Control loop design and hardware (e.g., matching measured and manipulated variables, sensors, control valves, and conceptual process control)

15. Safety, Health, and Environment **5–8**

A. Hazardous properties of materials (e.g., corrosivity, flammability, toxicity, reactivity, handling and storage), including SDS
B. Industrial hygiene (e.g., noise, PPE, ergonomics)
C. Process safety and hazard analysis [e.g., layer of protection analysis, hazard and operability studies (HazOps), fault-tree analysis or event tree]
D. Overpressure and underpressure protection (e.g., relief, redundant control, intrinsically safe)
E. Waste minimization, waste treatment, and regulation (e.g., air, water, solids, RCRA, CWA, EPA, OSHA)

16. Ethics and Professional Practice **2–3**

A. Codes of ethics (professional and technical societies)
B. Agreements and contracts
C. Ethical and legal considerations
D. Professional liability
E. Public protection issues (e.g., licensing boards)

Appendix I: Code of Ethics for Engineers

National Society of Professional Engineers®

Code of Ethics for Engineers

Preamble

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

I. Fundamental Canons

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

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

II. Rules of Practice

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

III. Professional Obligations

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

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

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

As Revised January 2003

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

Statement by NSPE Executive Committee

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

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

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

Note:

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

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