



State University of New York
College of Environmental Science and Forestry

Department of Paper and Bioprocess Engineering

Master of Professional Studies Paper and Bioprocess Engineering Program

The academic programs in the Department of Paper and Bioprocess Engineering (PBE) emphasize fundamental engineering science and engineering skills pertaining to chemical engineering with specialization in the pulp, paper and allied industries, and the bioprocess and chemical industries. Programs include courses in traditional areas of chemical engineering, applied chemistry, industrial bioprocessing, industrial biotechnology, chemical engineering, and pulp and paper technology. The department's educational programs at both the undergraduate and graduate levels are committed to preparing students for leadership roles in the paper and bioproduct industries.

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

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

- Non-thesis masters
- Paid Internships
- Full-time and part-time opportunities available
- Scholarships available from the Syracuse Pulp and Paper Foundation
- Companies ready to hire
- Starting salaries beginning at \$60,000/year

Applicants are expected to have a bachelor's degree in science or engineering and are expected to have completed courses in general chemistry, organic chemistry, physics, statistics, differential and integral calculus, and biology (for the bioprocess engineering options). Students admitted without necessary background may be required to take additional prerequisite courses required by the department. Students well-suited for the M.P.S. program in Paper and Bioprocess Engineering includes those with B.S. degrees in Engineering, Chemistry, Biology, Biotechnology, and Environmental Science.

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

Program Options

The M.P.S. program in paper and bioprocess engineering has three options:

- **Bioprocess Engineering**

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

- **Paper Science and Engineering**

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

- **Sustainable Engineering Management**

This option allows students to investigate either of the two topic areas above together with courses in business, management, policy, law, and other fields to form a Professional Science Master's program (PSM) recognized by the National PSM office (www.sciencemasters.com). The PSM concept is an innovative graduate degree designed to allow students to pursue advanced training in science or engineering while also developing skills in the areas of business, management, and other professional skills. The educational objectives of the MPS in Sustainable Engineering Management are to produce graduates who effectively practice engineering for the design and operation of systems and can also apply their knowledge of business, management, policy, and other areas to their particular area of Sustainable Engineering Management. Graduates will have an understanding of their technical field together with a background in business and management.

Students in the Sustainable Engineering Management program are encouraged to take the Certificate of Advanced Study in Sustainable Enterprise (CASSE) through the Whitman School of Management at Syracuse University. The certificate courses satisfy the plus course requirements of the Sustainable Engineering Management option. Further information on CASSE can be found at partnersforsustainability.org/curriculum.

Careers of Graduates

Graduates are finding positions with a variety of companies typically starting as entry-level engineers. Over the past five years, graduates have taken the following positions:

- Development Associate
- Electrical Project Manager
- Engineer III
- Process Engineer
- Research Associate
- Validation Engineer

A wide range of companies are hiring graduates of the M.P.S. program in Paper and Bioprocess Engineering. These companies have locations all across the United States. Employers of recent graduates of the M.P.S. program include:

- Biogen Idec
- Bristol-Myers Squibb
- Georgia-Pacific
- Grifols Diagnostic Solutions
- Lawrence Berkeley National Laboratory
- M-E Engineers
- Novartis Vaccines and Diagnostics
- Pratt Industries
- RockTenn
- Skye Media Ltd

Starting salaries for M.P.S. graduates have recently ranged from \$60,000 to \$75,000 annually.



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Option: Paper Science and Engineering

Number of credits	30	Financial support (by application)	
Core credits	15	Scholarships	✓
Elective credits	9-12	Assistantships	
Professional experience	3-6	Teaching Assistantships	✓

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

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



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Option: Bioprocess Engineering

Number of credits	30	Financial support (by application)	
Core credits	12	Scholarships	
Elective credits	12-15	Assistantships	
Professional experience	3-6	Teaching Assistantships	✓

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

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



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Option: Sustainable Engineering Management
(Paper Engineering)

Number of credits	36	Financial support (by application)	
Core credits	15	Scholarships	✓
Plus Courses	12	Assistantships	✓
Elective credits	3-6	Teaching Assistantships	✓
Professional experience	3-6		

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

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



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Option: Sustainable Engineering Management
(Bioprocess Engineering)

Number of credits	36	Financial support (by application)	
Core credits	12	Scholarships	✓
Plus Courses	12	Assistantships	✓
Elective credits	6-9	Teaching Assistantships	✓
Professional experience	3-6		

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

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



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Elective Courses

Paper Science and Engineering

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

Bioprocess Engineering

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

Other Engineering

GNE 661 Air Pollution Engineering (3)
ERE 530 Numerical and Computing Methods (3)
ERE 605 Sustainable Engineering (3)
ERE 640 Water Pollution Engineering (3)
CEN 5XX
CEN 6XX
CEN 7XX

Chemistry

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

Environmental Science

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

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



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Plus Courses

SUNY ESF

APM 510 Statistical Analysis
APM 595 Statistics for Engineers
APM 620 Experimental Design and ANOVA
APM 625 Sampling Techniques
APM 630 Regression Analysis
APM 635 Multivariate Statistical Methods
APM 645 Nonparametric Statistics and Categorical Data Analysis
CME 543 Construction Estimating
CME 653 Construction Planning & Scheduling
CME 654 Construction Project Management
EST 605 Qualitative Methods
EST 608 Environmental Advocacy Campaigns and Conflict Resolution
EST 612 Environmental Policy and Governance
EST 635 Public Participation & Decision Making: Theory and Application
EST 640 Environmental Thought & Ethics
EST 645 Mass Media & Environmental Affairs
EST609 Collaborative Governance Processes
EST650 Environ Perception & Human Behavior
FOR 519 Green Entrepreneurship
FOR 533 Natural Resource Managerial Economics
FOR 560 Principles of Management for Environmental Professionals
FOR 610 Environmental Resources Business
FOR 665 Natural Resources Policy
FOR 685 Business and Managerial Law
FOR 687 Environmental Law & Policy
FOR 689 Natural Resource Law & Policy
FOR 690 Integrated Resources Management
FOR 694 Writing for Scientific Publication
FOR 753 Advanced Natural Resource Policy
FOR 770 Ecological Economics and Policy
PSE 656 Management in the Paper Industry
PSE 680 Engineering Design Economics

SUNY-ESF/Syracuse University CASSE Courses

BUA/ECS 650/EST 696 Managing Sustainability: Purpose, Principles, and Practice

BUA/ECS 651 Strategic Management and the Natural Environment

BUA/ECS 759/EST 796 Sustainability-Driven Enterprise

Syracuse University

MBC 601 Economic Foundations of Business

MBC 602 Economics for International Business

MBC 603 Creating Customer Value

MBC 604 Managing the Marketing Mix

MBC 606 Information Technology for Decision Support

MBC 607 Understanding Financial Statements

MBC 608 Creating Financial Statements

MBC 609 Accounting for Managerial Decisions

MBC 616 Operations Management

MBC 617 Supply Chain Management

MBC 618 Competitive Strategy

MBC 619 Corporate Strategy

MBC 627 Financial Markets and Institutions

MBC 628 Fundamentals of Financial Management

MBC 629 Legal and Ethical Aspects of Management

MBC 630 Behavior in Organizations

MBC 631 Financial Accounting

MBC 632 Managerial Accounting

MBC 633 Managerial Finance

MBC 635 Operations and Supply Chain Management

MBC 636 Marketing Management

MBC 638 Data Analysis and Decision Making

MBC 639 Leadership in Organizations

MBC 642 Strategic Human Resource Management

MBC 643 The Legal, Natural, and Ethical

MBC 645 Strategic Management

SUNY Learning Network

EDF 715 Management Practice and Techniques Buffalo State

EDF 688 Leadership in Organizations Buffalo State

MLS 536 Problem Solving Procedures Plattsburgh

MBA 502 Principles of Economics Oswego

MBA 516 International Business Oswego

Oswego State University MBA Program

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

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