

# Bioprocess Engineering

Renewable Bioproducts for the 21<sup>st</sup> Century



The Bioprocess Engineering (BPE) programs, offered by the Faculty of Paper and Bioprocess Engineering (PBE), prepare students for careers as engineers in positions that would have typically been filled with chemical engineers with additional biological training. The BPE programs seek to train engineers in chemical process engineering coupled with coursework in microbiology, biochemistry and bioprocess engineering. The curriculum draws bioprocess engineering examples from the development of products and energy from sustainable sources and from the biopharmaceutical industry. The program builds on the long-standing success of the current Paper Engineering program.

## Bachelor of Science

Bioprocess Engineering

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

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 biotechnologies. In addition, a summer internship is required of all students in which they gain valuable skills and experience the areas 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, 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 engineering 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.

## Advanced Graduate Certificate

Bioprocessing

This Certificate Program, developed through a collaborative effort between business (local businesses and the Manufacturers Association of Central New York) and academia, takes advantage of this region's unique expertise and resources in bioprocess engineering. Graduates of the program will support the development and manufacture of products produced through bioprocesses, such as those produced in the pharmaceutical and fermentation industries and biorefineries.

The curriculum consists of five technical courses including microbiology, bioseparations, bioprocess design and bioprocess engineering. A capstone Professional Experience/Synthesis course is included that will provide participants with a variety of skills supporting the technical aspects of the program. The capstone course will challenge students to use the skills they learned throughout the program and apply those skills to relevant business settings.

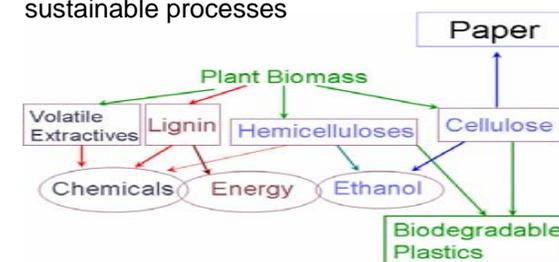
The Certificate provides graduate education in bioprocess engineering that leads to a documented level of competency for practice, a structured and documented course of study at the graduate level, and a means for students to improve their competitive position in the employment marketplace.

## Master of Science / Doctor of Philosophy

Renewable Energy and Bioprocess Engineering

Students in this area of study work towards either the M.S. or Ph.D. degree in Environmental and Resource Engineering. It encompasses the use of renewable and sustainable resources (e.g., wood) for the production of chemicals, advanced materials, and fuel, as well as the use of bioprocessing technology to produce such products. This area extends to the production of energy from renewable resources including such technology as gasification, co-firing of byproducts, anaerobic digestion, solar energy, and ethanol from biomass. Courses concerned with this area of study would include selected courses in chemical engineering, advanced chemistry, biotechnology, and bioengineering, building on a strong base of mathematics, chemistry, and biology. Current research projects in this area include the bioseparation of xylan from hardwoods, the production of ethanol and acetic acid from wood hemicelluloses, development of separation processes for various bioproducts, gasification, enzymatic processing of lignocellulosic materials, and chemical production from sustainable resources as a replacement for nonrenewable fossil fuels.

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



## Other Educational Programs in PSE

### Bachelor of Science

- Paper Engineering\*
- Paper Science\*

### Master of Science / Doctor of Philosophy

- Chemistry of Pulping and Bleaching
- Colloid Chemistry and Fiber Flocculation
- Fiber and Paper Mechanics
- Process and Environmental Systems Engineering
- Pulp and Paper Technology

### Undergraduate Minors

- Paper Science
- Bioprocess Science
- Computer and Information Technology

\*Scholarships available through the Syracuse Pulp and Paper Foundation

## Central New York Biotechnology Research Center

The CNY BRC is a research and teaching center that is a collaboration between Upstate Medical University, the Syracuse Veterans Hospital, SUNY-ESF, Syracuse University and Le Moyne College. Located within walking distance of SUNY-ESF, the CNY BRC will house a state-of-the-art bioprocessing pilot plant and modern laboratories and classes for the study of bioprocess engineering. The Center will bring together multidisciplinary research teams to collaborate with industry to develop and transfer bioprocess technology.



## Careers

Graduates at all levels are well prepared to begin their careers immediately after graduation, either in manufacturing, engineering, product development, or research. Graduates from the PSE Faculty have historically enjoyed a very high rate of employment with salaries among the top 5 percent of all U.S. college graduates.

## Studying at ESF

SUNY-ESF is located in Syracuse, NY approximately 240 miles northwest of New York City. It is adjacent to and shares resources with Syracuse University. SUNY Upstate Medical University is also nearby. World-class faculty and staff together with well-equipped laboratories, including pilot-scale bioprocessing facilities, make SUNY-ESF one of the leaders in the field of industrial applications of biotechnology.

The College offers competitive financial aid for undergraduate students along with support packages for students at the graduate level.

For more information:

### Faculty of Paper and Bioprocess Engineering

Tel: 315-470-6501  
Email: [bioprocess@esf.edu](mailto:bioprocess@esf.edu)  
Web: [www.esf.edu/pse](http://www.esf.edu/pse)

### Office of Undergraduate Admissions

Tel: 800-777-7373 / 315-470-6600  
Email: [esfinfo@esf.edu](mailto:esfinfo@esf.edu)  
Web: [www.esf.edu/admissions](http://www.esf.edu/admissions)

### Office of Instruction and Graduate Studies

Tel: 315-470-6599  
Email: [esfgrad@esf.edu](mailto:esfgrad@esf.edu)  
Web: [web.esf.edu/gweb](http://web.esf.edu/gweb)

### Office of Continuing Education

Tel: 315-470-6817  
Email: [outreach@esf.edu](mailto:outreach@esf.edu)  
Web: [web.esf.edu/oweb](http://web.esf.edu/oweb)

### CNY Biotechnology Research Center

Tel: 315-464-9857  
Email: [FieschkJ@upstate.edu](mailto:FieschkJ@upstate.edu)  
Web: [www.upstate.edu/biocenter](http://www.upstate.edu/biocenter)



## BIOPROCESS ENGINEERING

### Faculty of PAPER AND BIOPROCESS ENGINEERING

### Renewable Bioproducts for the 21<sup>st</sup> Century

205 Walters Hall  
One Forestry Drive  
Syracuse, NY 13210

Tel: 315-470-6501  
Fax: 315-470-6945  
[bioprocess@esf.edu](mailto:bioprocess@esf.edu)

Web: [www.esf.edu/pse](http://www.esf.edu/pse)



State University of New York  
College of Environmental Science  
and Forestry