Undergraduate Program in

CHEMICAL AND BIOLOGICAL ENGINEERING

What Do Chemical and Biological Engineers Do?

CBE graduates apply chemistry to make things that people can use. This is **PRODUCT ENGINEERING** and examples include:

- Portable water purifiers
- Energy-efficient windows
- Ozone-safe refrigerants
- Pollution-preventing ink
- A home-use ventilator
- Stain-resistant fabrics
- Pacemaker batteries
- Drug-delivery patches
- Artificial organs
- A cure for cancer *(really)*

CBE graduates help to solve the material needs of society, ensuring that there is enough to go around today and in the future. This is **PROCESS ENGINEERING** and contemporary examples include:

- How can we make environmentally friendly plastic water bottles and food packaging from corn?
- A lifesaving drug has been discovered in a tropical plant. How can we make enough of it to satisfy the needs of all people who need this cure?
- A competitor overseas can make a product with less cost because regulations there are not as strict. How can we improve our manufacturing process to remain competitive?
- Flexible display devices can be made by coating organic molecules on a polymer substrate. How can we make enough of these to satisfy demand and keep them affordable?

Employers

Any company that is in the business of making some physical product must employ chemical engineers. This includes the obvious companies such as Dow, Dupont and ExxonMobil, as well as ones you may not have expected, such as IBM, Chrysler, Nabisco, Merck, Molson, and so on.

Facts About CBE@UB

- Full-time faculty: 22
- Average class size: 70
- Average ChE starting salary: **$68,000** (BS)
- Events held by CBE students: about 30 per year
- Lecture courses taught by teaching assistants: 0

Degrees Offered

- BS, MS, M Eng, PhD (all in Chemical Engineering)
- A five-year BS in Chemical Engineering + MBA is also available

Curriculum Overview

[FRESHMAN-SOPHOMORE]

The first two years build the basic science and mathematics skills that you need for the practice of chemical engineering: four chemistry courses, including organic chemistry; two semesters of physics; math through differential equations; and one required course in biotechnology. Chemical engineering courses start in the sophomore year.

[JUNIOR]

The third year develops the engineering sciences. Here you learn to control the movement of mass and energy, and how to engineer chemical reactions. You learn how to purify things on a large scale. You discover why materials behave as they do, and how to manipulate them. Hands-on laboratories build practical skills from the classroom instruction.

[SENIOR]

Study of chemical and biological systems is coupled with practice of design to provide the capstone to the degree. The material you learned in the first three years comes together synergistically. Product and process design are given equal emphasis.

Employment Outlook

The U.S. Bureau of Labor Statistics predicts that chemical engineering is expected to have employment growth from 2012 to 2022.

Please see: http://www.bls.gov/ooh/architecture-and-engineering/chemical-engineers.htm.

Did You Know?

About 30 of our students each year work on undergraduate research. This is a great experience, getting involved in actual research at the frontier of new scientific knowledge and technology, and working closely with a faculty member and graduate students. This experience also looks very impressive on a resume. CBE undergraduates do both experimental and computational projects, and have become published as co-authors on scientific papers.

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Training for the Real World through the CBE Spiral Learning Initiative

UB CBE is using an exciting new program to enhance students' effectiveness at designing real-world chemical processes as they enter the workplace. When you start taking CBE courses as a sophomore, you are already fine-tuning the capstone plant design project you will tackle in your final semester. Students get special "spiral" assignments and exam problems in various courses that introduce and revisit skills that will be especially useful to them in designing part of a chemical plant two-and-a-half years later.

For example, last spring seniors designed the reactors and separations units needed to make 100 million lb/year of lactic acid, the feed stock for production of an environmentally friendly "plant plastic" increasingly used for water bottles, food packaging and medical products. Along the way we repeatedly infused them with useful skills supporting this project in their transport, reactor engineering and other courses, so that they would be more ready to be creative designers.

Work Opportunities

"UB can help students find valuable opportunities to gain work experience even before graduation. I worked at an internship with Praxair and enhanced my understanding of industrial gas production. This valuable experience developed my professional growth and also counted for three course credits. Working on site at the production plant was a learning experience unlike any I have had in a classroom. The observation of chemical engineering principles in real world practice has given me a greater appreciation for the theories that I have learned in the classroom and has challenged me to think in new ways to address real world factors. My work experience has further developed my chemical engineering knowledge and given me great perspective for what to expect once I start my career."

—**Alex Tomasik**, Former UB CBE Undergraduate Student

Did You Know?

You can get paid to go to graduate school. About 20% of our graduates go on to pursue advanced study toward a PhD. Some choose to continue their studies here, while others go to study at other elite graduate programs nationwide (e.g., Princeton, MIT, Carnegie Mellon, Cornell, Minnesota, Michigan...). Students admitted to the PhD program at any of these schools receive not just full tuition scholarships, but also a modest stipend to support their study (about $20,000/year; enough to live on, but not enough for a fancy car).

Student Clubs and Activities

"UB's student chapter of AIChE is a club committed to encouraging academic and professional progress by providing all the necessary resources for success. The club brings students together, and connects them with the CBE department, professors and industry professionals. The club hosts speakers, plant tours, monthly meetings, and social events, in addition to attending both the national and regional conferences and competing in the Chem-E Car competition. We have developed a mentorship program connecting underclassman to upperclassman within the chemical engineering department. The club is also involved in outreach events. We have attended the Buffalo Museum of Science during Engineers Week to teach kids about engineering and make them liquid nitrogen ice cream. Getting involved with the student chapter of AIChE at UB is a great way to make valuable connections, learn about the chemical industry, and have fun interacting with other Chemical Engineers."

—**Emily Benz**, UB AIChE chapter president, 2014-2015

Award-Winning Faculty

UB CBE faculty are very active in education and research, and are well recognized within and outside the university for their accomplishments. Distinctions include four recipients of the SUNY Chancellor's Award for Excellence in Teaching, seven National Science Foundation Young Investigator awards, three members of the National Academy of Engineering, a recipient of the National Medal of Science (the National Medal provides the nation's highest scientific honor), as well as numerous other national research and teaching awards. Our faculty ranks also include two SUNY Distinguished Professors and two SUNY Distinguished Teaching Professors.

To apply, please visit **admissions.buffalo.edu**

Anna Smith—2016 Barry Goldwater Scholarship awardee

Congratulations to **Anna Smith**, who has won the prestigious Goldwater Scholarship. She will receive up to $7,500 per year to cover educational expenses for her pursuit of a graduate degree in engineering. "I plan to launch my own company based on products developed from novel research ideas that I will work on during my Ph.D. and beyond. In addition to my aspirations to make advancements in research and bring these ideas to fruition in industry, I am committed to serving the community by promoting the STEM fields through outreach and mentorship programs."

Since, 2012, seven UB CBE students have won the prestigious Goldwater Scholarship, which was established by Congress in 1986 in honor of Sen. Barry Goldwater.

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