

# MAJOR IN CHEMICAL AND BIOLOGICAL ENGINEERING

Chemical and biological engineering is a powerful blend of basic sciences and the skills to quantitatively describe, predict, and control all changes of matter. This provides the foundation to create cutting-edge materials and products, to design new devices to improve health or the environment, and to design processes for the safe production of chemicals and biochemicals, the production of alternative energy sources, and prevention of hazardous waste.

The Chemical and Biological Engineering curriculum is based on the sciences of physics, chemistry, biology, and mathematics. It includes engineering science and design methods, as well as humanities and social sciences. Students can pursue interdisciplinary studies programs or minors. Popular options include minors in chemistry, mathematics, environmental engineering, and biomedical engineering. The curriculum is well-aligned to meet pre-health profession requirements. The Chemical and Biological Engineering program provides an environment that promotes a sense of professionalism, the development of project management skills, and an appreciation for the value of life-long learning. Graduates of our program are well prepared to enter a variety of professions, or to pursue further education. The broad, strong scientific basis of chemical and biological engineering has kept our graduates consistently near or at the top in salary and demand among B.S. graduates.

The Chemical and Biological Engineering major is accredited by the Engineering Accreditation Commission of ABET (<https://www.abet.org/>).

## Concentrations

While our undergraduate program gives students the option to keep their studies broad, they may also specialize in one of the following concentrations:

- Advanced Materials Concentration (<http://catalog.colostate.edu/general-catalog/colleges/engineering/biomedical-chemical-engineering/chemical-biological-engineering-major-advanced-materials-concentration/>)
- Biomanufacturing Concentration (<http://catalog.colostate.edu/general-catalog/colleges/engineering/biomedical-chemical-engineering/chemical-biological-engineering-major-biomanufacturing-concentration/>)
- Molecular Medicine Concentration (<http://catalog.colostate.edu/general-catalog/colleges/engineering/biomedical-chemical-engineering/chemical-biological-engineering-major-molecular-medicine-concentration/>)
- Sustainable Engineering Concentration (<http://catalog.colostate.edu/general-catalog/colleges/engineering/biomedical-chemical-engineering/chemical-biological-engineering-major-sustainable-engineering-concentration/>)

## Program Learning Objectives

The Chemical and Biological Engineering program at CSU will empower graduates with the educational foundation to:

1. Be highly successful, as defined by accomplishments, advanced certifications, and job satisfaction, in chemical and biological

engineering practice, post-graduate education, or other careers making use of engineering knowledge.

2. Be identified for both their mastery of fundamental chemical and biological engineering principles and their creative application of those principles to the solution of problems across a diverse range of career disciplines.
3. Be recognized as critical, creative and independent thinkers who use their technical expertise and leadership to address the needs of society and advance their fields of expertise.
4. Be recognized for their effectiveness in teamwork, communication, and service to society through their professional contributions.
5. Hold paramount health and safety of the public and the environment.
6. Demonstrate the highest standards of professional, ethical, and civic responsibility in all endeavors.
7. Demonstrate continued professional growth through a commitment to lifelong learning.

## Student Outcomes

Graduates of the undergraduate Chemical and Biological Engineering programs will have the ability to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Communicate effectively with a range of audiences
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

## Potential Occupations

Chemical and Biological Engineering graduates find employment in the biotechnology, biomedical, microelectronics, environmental, consulting, alternative energy, petroleum, chemical, food, pharmaceutical and other private sector industries and with government agencies. Participation in undergraduate research, internships, volunteer activities, or cooperative education opportunities is highly recommended to enhance practical training and development. Graduates who go on for advanced studies can attain more responsible positions with the possibility of rising to top professional levels. In addition to pursuing M.S. and Ph.D. degrees in chemical and biological engineering and related fields, some of our graduates have obtained M.D., D.V.M., law, and M.B.A. degrees.