CHEMICAL ENGINEERING MAJOR (B.S.)

https://ceps.unh.edu/chemical-engineering-bioengineering/program/bs/chemical-engineering-major

Description

Chemical engineering is concerned with the analysis and design of processes that deal with the transfer and transformation of energy and material. The practice of chemical engineering includes the conception, development, design, and application of physicochemical processes and their products; the development, design, construction, operation, control, and management of plants for these processes; and activities relating to public service, education, and research.

The curriculum prepares students for productive careers in industry or government and provides a foundation for graduate studies. The program emphasizes chemical engineering fundamentals while offering opportunities for focused study in bioengineering, energy or environmental engineering.

Traditional employment areas in the chemical process industries include industrial chemicals, petroleum and petrochemicals, plastics, pharmaceuticals, metals, textiles, and food. Chemical engineers also are working in increasing numbers in the areas of energy engineering, pollution abatement, and biochemical and biomedical engineering; in addition, they are employed by many government laboratories and agencies as well as private industries and institutions.

Graduates from the program have the ability to apply knowledge of mathematics, science, and engineering to identify, formulate, and solve chemical engineering problems as well as to design and conduct experiments safely and analyze and interpret data. They are prepared to pursue advanced studies in chemical engineering. Program graduates gain a sense of professional and ethical responsibility with the ability to apply environmental, safety, economic, and ethical criteria in the design of engineering processes. They learn to function as individuals or in a team and gain skills in written and oral communication and effectively use computers for engineering practice, including information search in the library and online. They also understand the need for lifelong learning and the significance of societal and global issues relevant to chemical engineering.

The Chemical Engineering program (B Sci in Chemical Engineering) is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org, under the General Criteria and the Program Criteria for Chemical, Biochemical, Biomolecular and Similarly Named Engineering Programs.

Requirements

Degree Requirements

Minimum Credit Requirement: 129 credits

Minimum Residency Requirement: 32 credits must be taken at UNH

Minimum GPA: 2.0 required for conferral*

Core Curriculum Required: Discovery & Writing Program Requirements

Foreign Language Requirement: No

All Major, Option and Elective Requirements as indicated.
**Major GPA requirements as indicated.*

Major Requirements

A minimum of 129 credits is required for graduation with the degree of bachelor of science in chemical engineering. There are nine electives in the chemical engineering curriculum. Six of these are for the Discovery Program requirements. The remaining three electives are chemical engineering electives.

Students are required to obtain a minimum 2.0 grade-point average in CHBE 501 Material Balances and CHBE 502 Energy Balances and in overall standing at the end of the sophomore year in order to continue in the major. Study abroad (Exchange) chemical engineering students are required to have a cumulative GPA of 3.0 or better in math, physics, chemistry, and CHBE courses at the end of the semester prior to their exchange semester.

Code	Title	Credits
Required Courses		
CHBE 400	Chemical and Bioengineering Lectures	1
CHBE 501	Material Balances	3
CHBE 502	Energy Balances	3
CHBE 601	Fluid Mechanics and Unit Operations	3
CHBE 602	Heat Transfer and Unit Operations	3
CHBE 603	Applied Mathematics for Chemical Engineers	4
CHBE 604	Chemical Engineering Thermodynamics	3
CHBE 612	Chemical Engineering Laboratory I	3
CHBE 614	Separation Processes	3
CHBE 703	Mass Transfer and Stagewise Operations	3
CHBE 707	Chemical Engineering Kinetics	3
CHBE 708	Chemical Engineering Design	4
CHBE 713	Chemical Engineering Laboratory II	3
CHBE 752	Process Dynamics and Control	4
CHEM 405	Chemical Principles for Engineers	4
CHEM 651	Organic Chemistry I	3
CHEM 652A	Organic Chemistry II	3
CHEM 653	Organic Chemistry Laboratory	2
CHEM 683	Physical Chemistry I	3
CHEM 684	Physical Chemistry II	3
CHEM 685	Physical Chemistry Laboratory	2
CHEM 686	Physical Chemistry Laboratory	2
MATH 425	Calculus I	4
MATH 426	Calculus II	4
MATH 527	Differential Equations with Linear Algebra	4
MATH 644	Statistics for Engineers and Scientists	4
PHYS 407	General Physics I	4
PHYS 408	General Physics II	4

Code	Title	Credits
Elective Courses		
Select three courses from the following:		
CHBE 651	Biotech Experience/Biomanufacturing	4
CHBE 705	Fossil Fuels and Renewable Energy Sources	4
CHBE 706	Electrochemical Methods: Fundamentals and Applications	4
CHBE 709	Fundamentals of Air Pollution and Its Control	4
CHBE 712	Introduction to Nuclear Engineering	4
CHBE 722	Introduction to Microfluidics	4
CHBE 744	Corrosion	4
CHBE 755	Computational Molecular Bioengineering	4
CHBE 761	Biochemical Engineering	4

CHBE 762	Biomedical Engineering	4
CHBE 766	Biomaterials	4

Degree Plan

Sample Degree Plan

This sample degree plan serves as a general guide; students collaborate with their academic advisor to develop a personalized degree plan to meet their academic goals and program requirements.

First Year		
Fall		**Credits**
CHBE 400	Chemical and Bioengineering Lectures	1
CHEM 405	Chemical Principles for Engineers [3]	4
ENGL 401	First-Year Writing [1]	4
MATH 425	Calculus I [2]	4
Discovery Program Electives [6]		4
	Credits	**17**
Spring		
MATH 426	Calculus II	4
PHYS 407	General Physics I [3]	4
Discovery Program Electives (2) [6]		8
	Credits	**16**
Second Year		
Fall		
CHBE 501	Material Balances	3
CHEM 683	Physical Chemistry I	3
CHEM 685	Physical Chemistry Laboratory	2
MATH 527	Differential Equations with Linear Algebra	4
PHYS 408	General Physics II	4
	Credits	**16**
Spring		
CHBE 502	Energy Balances [4]	3
CHEM 684	Physical Chemistry II	3
CHEM 686	Physical Chemistry Laboratory	2
MATH 740 or MATH 644	Design of Experiments I [6] or Statistics for Engineers and Scientists	4
Discovery Program Elective [6]		4
	Credits	**16**
Third Year		
Fall		
CHBE 601	Fluid Mechanics and Unit Operations	3
CHBE 603	Applied Mathematics for Chemical Engineers	4
CHEM 651	Organic Chemistry I	3
CHEM 653	Organic Chemistry Laboratory	2
Chemical Engineering Elective		4
	Credits	**16**
Spring		
CHBE 602	Heat Transfer and Unit Operations	3
CHBE 604	Chemical Engineering Thermodynamics	3
CHBE 612	Chemical Engineering Laboratory I	3
CHEM 652A	Organic Chemistry II	3
Discovery Program Elective [6]		4
	Credits	**16**
Fourth Year		
Fall		
CHBE 703	Mass Transfer and Stagewise Operations	3
CHBE 707	Chemical Engineering Kinetics	3
CHBE 713	Chemical Engineering Laboratory II	3
CHBE 752	Process Dynamics and Control	4
Chemical Engineering Elective		4
	Credits	**17**
Spring		
CHBE 614	Separation Processes	3
CHBE 708	Chemical Engineering Design [5]	4
Chemical Engineering Elective		4
Discovery Elective [6]		4
	Credits	**15**
	Total Credits	**129**

1. ENGL 401 First-Year Writing satisfies the Discovery Foundation Writing Skills category.
2. MATH 425 Calculus I satisifies the Discovery Foundation Quantitative Reasoning category.
3. PHYS 407 General Physics I or CHEM 405 Chemical Principles for Engineers satisfies the Discovery Physical Science (with lab) category.
4. CHBE 502 Energy Balances satisfies the Discovery Inquiry requirement.
5. CHBE#708 Chemical Engineering Design satisfies the Discovery Capstone Experience/Course.
6. Chemical Engineering students do not have to take a course in the Discovery ETS category since they satisfy this requirement through a combination of courses in the curriculum.

Student Learning Outcomes

Program Learning Outcomes
By the time of graduation, students will have:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- an ability to 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.
- an ability to communicate effectively with a range of audiences.
- an ability to 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.
- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.