CHEMICAL ENGINEERING (CHE)

The Department of Chemical Engineering currently offers the undergraduate degree program in chemical engineering with options in bioengineering, energy engineering, and environmental engineering.

The B.S. program in chemical engineering is accredited by the:

Engineering Accreditation Commission of ABET
111 Market Place
Suite 1050
Baltimore, MD 21202-4012
(410) 347-7700

Chemical engineering is concerned with the analysis and design of processes that deal with the transfer and transformation of energy and material into products of high value.

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 college's program emphasizes chemical engineering fundamentals while offering opportunities for focused study in energy, environmental, or bio-engineering.

Traditional employment areas in the chemical process industries include industrial chemicals, petroleum and petrochemicals, plastics, pharmaceuticals, metals, textiles, and food. Chemical engineers are also 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.

Mission

The department strives to prepare students for productive careers in industry or government as well as to provide a foundation for graduate studies. The program emphasizes chemical engineering fundamentals while offering opportunities for focused study in energy, environmental, or bio-engineering.

Program Educational Objectives

The chemical engineering program seeks to provide an environment that enables students to pursue their goals in an innovative, rigorous, and challenging program with a diversity of offerings.

The program has the following major educational objectives with the expectation that our alumni will have successful careers in the many diverse areas of the chemical engineering profession. Within a few years of obtaining a bachelor's degree in chemical engineering, we expect our graduates to have the following attributes:

Depth. To be effective in applying chemical engineering principles in engineering practice or for advanced study in chemical engineering.

Breadth. To have a productive career in the many diverse fields of chemical engineering such as bio-engineering, energy, and the environment, or in the pursuit of graduate education in disciplines such as chemical engineering, medicine, law, or business.

Professionalism. To function effectively in the complex modern work environment with the ability to assume professional leadership roles.

https://ceps.unh.edu/chemical-engineering

Programs

- Chemical Engineering Major (B.S.)
- Chemical Engineering Major: Bioengineering Option (B.S.)
- Chemical Engineering Major: Energy Option (B.S.)
- Chemical Engineering Major: Environmental Engineering Option (B.S.)

Courses

Chemical Engineering (CHE)

CHE 400 - Chemical Engineering Lectures
Credits: 1
Introduces the profession, the process engineer as designer and problem solver; and the goals of the chemical engineering/bioengineering curriculum. Lectures by faculty and practitioners. Introduction to computer skills, engineering ethics, safety, and careers in chemical engineering and bioengineering. Cr/F.

CHE 410 - Energy and Environment
Credits: 4
Energy supply in this country and the world; conventional fuel reserves: coal, oil, natural gas; alternative sources: nuclear, solar, geothermal, et. Forecasts and strategies to meet needs. Environmental pollution, sources, and economic and environmental impacts. Methods for pollution control. Regulatory standards for environmental protection.
Attributes: Physical Science(Discovery)
Equivalent(s): CHE 410H

CHE 501 - Introduction to Chemical Engineering I
Credits: 3
Systems of units; material balances and chemical reactions; gas laws; phase phenomena.

CHE 502 - Introduction to Chemical Engineering II
Credits: 3
Energy and material balances for systems with and without chemical reactions; design case studies.
Attributes: Inquiry (Discovery)

CHE 601 - Fluid Mechanics and Unit Operations
Credits: 3
Continuity, momentum, and energy equations; laminar and turbulent flow in pipes; rheology. Applications to flow in porous media, filtration, and fluidization.

CHE 602 - Heat Transfer and Unit Operations
Credits: 3
Thermal properties of materials, steady-state and transient conduction and convection; radiation; applications to heat exchangers and process equipment.

CHE 603 - Applied Mathematics for Chemical Engineers
Credits: 0 or 4
Mathematical modeling and analysis of chemical engineering problems. Analytical methods for first- and second-order differential equations; numerical solutions; series solutions; Bessel functions; Laplace transforms; matrix algebra. Interpretation and solution of partial differential equations. Lab.

CHE 604 - Chemical Engineering Thermodynamics
Credits: 3
Volumetric and phase behavior of ideal and real gases and liquids; cycles; steady-flow processes; chemical equilibrium.

CHE 612 - Chemical Engineering Laboratory I
Credits: 3
Selected experiments in fluid mechanics, heat transfer, and unit operations. Writing intensive.
Attributes: Writing Intensive Course

CHE 614 - Separation Processes
Credits: 3
Adsorption, Chromatography, Membrane Separations, Liquid-liquid, Extraction and Crystallization, requires junior level studies in chemical engineering or permission.

CHE 651 - Biotech Experience/Biomanufacturing
Credits: 4
Course begins by introducing students to the proteins and companies of biotechnology and to current good manufacturing practices.
For remainder of the course, students use cell culture of bacteria, mammalian and yeast cells to produce human proteins using the tools and manufacturing standards, operating procedures of biotechnology, including upstream and downstream processing of proteins, and quality control of protein production. Permission required. Also listed as ANSC 651 and MICR 651.
Equivalent(s): ANSC 651, MICR 651

CHE 695 - Chemical Engineering Project
Credits: 1-4
Independent research problems carried out under faculty supervision.

CHE 696 - Independent Study
Credits: 1-4
Prereq: permission of the adviser and department chairperson; granted only to students having superior scholastic achievement.

CHE 703 - Mass Transfer and Stagewise Operations
Credits: 3
Diffusion in gases, liquids, and solids; design and analysis of distillation, absorption, and other stagewise equipment and operations.

CHE 705 - Fossil Fuels and Renewable Energy Sources
Credits: 4
Processing and refining of coal, crude oil, natural gas, tar sands and shale oil. Biomass co-combustion, biofuel extraction, impediments to widespread utilization. Exploration of environmental issues with energy generation and consumption. Lab.

CHE 706 - Electrochemical Methods for Energy Applications
Credits: 4
Fundamentals and applications of thermodynamics of electrochemical processes; kinetics of electrochemical reactions; electrocatalysis basics and current technologies for batteries, supercapacitors and fuel cells. Prereq: CHEM 683, CHEM 684.

CHE 707 - Chemical Engineering Kinetics
Credits: 3
Use of laboratory data to design commercial reactors. Continuous, batch, plug-flow, and stirred-tank reactors for homogeneous and catalytic multiphase reactions.

CHE 708 - Chemical Engineering Design
Credits: 4
Introduction to cost engineering. Application of acquired skills to design of chemical processes. Individual major design project required. Safety for industrial processes. Lab. Writing intensive.
Attributes: Writing Intensive Course
Equivalent(s): CHE 608, CHE 608E, ENE 608, ENE 708

CHE 709 - Fundamentals of Air Pollution and Its Control
Credits: 4
The origin and fate of air pollutants. Fundamentals of atmospheric meteorology, chemistry, and dispersion phenomena. Control of air pollutants and the related equipment. Current issues. Lab.
Equivalent(s): ENE 709

CHE 712 - Introduction to Nuclear Engineering
Credits: 4
Development of nuclear reactors; binding-energy; radioactivity; elements of nuclear reactor theory; engineering problems of heat transfer, fluid flow, materials selection, and shielding; environmental impacts.

CHE 713 - Chemical Engineering Laboratory II
Credits: 3
Selected experiments in mass transfer, stagewise operations, thermodynamics, and kinetics. Writing intensive.
Attributes: Writing Intensive Course

CHE 714 - Chemical Sensors
Credits: 4
Interdisciplinary approach using thermodynamic, physical and surface chemistry, kinetic, electrochemical, and optical principles to analyze and design chemical sensors. Topics will include selectivity and sensitivity pf sensors, biosensors, electrochemical sensors, mass sensors, optical sensors, and multivariate sensors. Lab. Prereq: Math 527; CHEM 405 (or equivalent); or permission.

CHE 722 - Introduction to Microfluidics
Credits: 4
Fundamentals and applications of microfluidics; scaling laws; microfabrication technology; hydrodynamics and electrodynamics; interfacial phenomena; capillary effects and diffusion; microvalves; micropumps; lab-on-a-chip systems; biochips. Prereq: fluids mechanics course or permission of instructor.

CHE 744 - Corrosion
Credits: 4
Fundamentals of corrosion processes in industrial and environmental settings; thermodynamics, kinetics, and mass transport in local corrosion cells; protection by electrochemical, chemical, surface modification or barrier methods; instrumental methods in corrosion science. Lab.

CHE 752 - Process Dynamics and Control
Credits: 4
Dynamic behavior of chemical engineering processes described by differential equations; feedback control concepts and techniques; stability analysis. Lab.

CHE 761 - Biochemical Engineering
Credits: 4
Immobilized enzyme technology, microbial biomass production, transport phenomena in microbial systems, biological reactor design, process instrumentation and control, applications in separation and purification processes. Lab.

CHE 762 - Biomedical Engineering
Credits: 4
Overview of the biomedical engineering through topical studies such as drug delivery and sensors. Discussion of modern engineering methods through primary research sources. Prereq: differential equations and statistics. Writing intensive. Also listed as BENG 762.
Attributes: Writing Intensive Course
Equivalent(s): BENG 762

CHE 766 - Biomaterials
Credits: 4
Fundamental principles of biology and material science, along with latest topics in biomaterials research. Topics include cell biology, wound healing, host response to foreign materials, polymers, hydrogels, diffusion and methods of material characterization. Specific medical applications of biomaterials such as orthopedic and dental implants, heart valves, artificial blood vessels, cochlear and ophthalmic implants and tissue engineering. Laboratory. Students are expected to have some background in chemistry, mathematics, and high school biology. Also listed as BENG 766.
Equivalent(s): BENG 766

Faculty

https://ceps.unh.edu/chemical-engineering/people