

CHEMICAL ENGINEERING (CHE)

Course numbers with the # symbol included (e.g. #400) have not been taught in the last 3 years.

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/Bioengineering

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 of 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 electrostatics; 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