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.
Grade Mode: Credit/Fail Grading

CHE 410 - Energy and Environment
Credits: 4
Attributes: Physical Science(Discovery)
Equivalent(s): CHE 410H
Grade Mode: Letter Grading

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

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)
Grade Mode: Letter Grading

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.
Grade Mode: Letter Grading

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.
Grade Mode: Letter Grading

CHE 603 - Applied Mathematics for Chemical Engineers
Credits: 0 or 4
Grade Mode: Letter Grading

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

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

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

CHE 651 - Biotech Experience/Biomanufacturing
Credits: 0 or 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
Mutual Exclusion: No credit for students who have taken BIOT 775.
Grade Mode: Letter Grading

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

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

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

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.
Grade Mode: Letter Grading

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.
Grade Mode: Letter Grading

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.
Grade Mode: Letter Grading
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
<th>Grade Mode</th>
<th>Equivalent(s)</th>
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<tbody>
<tr>
<td>CHE 707</td>
<td>Chemical Engineering Kinetics</td>
<td>3</td>
<td>Use of laboratory data to design commercial reactors. Continuous, batch, plug-flow, and stirred-tank reactors for homogeneous and catalytic multiphase reactions.</td>
<td>Letter Grading</td>
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<tr>
<td>CHE 712</td>
<td>Introduction to Nuclear Engineering</td>
<td>4</td>
<td>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.</td>
<td>Letter Grading</td>
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<td>CHE 713</td>
<td>Chemical Engineering Laboratory II</td>
<td>3</td>
<td>Selected experiments in mass transfer, stagewise operations, thermodynamics, and kinetics. Writing intensive.</td>
<td>Letter Grading</td>
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<tr>
<td>CHE 714</td>
<td>Chemical Sensors</td>
<td>4</td>
<td>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.</td>
<td>Letter Grading</td>
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<tr>
<td>CHE #722</td>
<td>Introduction to Microfluidics</td>
<td>4</td>
<td>Fundamentals and applications of microfluidics; scaling laws; microfabrication technology; hydrodynamics and electrodynamics; interfacial phenomena; capillary effects and diffusion; microwaves; micropumps; lab-on-a-chip systems; biochips. Prereq: fluids mechanics course or permission of instructor.</td>
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<td>CHE 744</td>
<td>Corrosion</td>
<td>4</td>
<td>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.</td>
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<td>CHE 752</td>
<td>Process Dynamics and Control</td>
<td>4</td>
<td>Dynamic behavior of chemical engineering processes described by differential equations; feedback control concepts and techniques; stability analysis. Lab.</td>
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<td>CHE 761</td>
<td>Biochemical Engineering</td>
<td>4</td>
<td>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.</td>
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<td>CHE 762</td>
<td>Biomedical Engineering</td>
<td>4</td>
<td>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.</td>
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<td>BENG 762</td>
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<td>CHE 766</td>
<td>Biomaterials</td>
<td>4</td>
<td>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.</td>
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