

# CHEMICAL ENGINEERING (CHE)

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

## **CHE 805 - 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. (Not offered every year.)

**Grade Mode:** Letter Grading

## **CHE 806 - 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. (Not offered every year.)

**Grade Mode:** Letter Grading

## **CHE 812 - 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. (Not offered every year.)

**Grade Mode:** Letter Grading

## **CHE 814 - 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.

**Grade Mode:** Letter Grading

## **CHE #822 - Introduction to Microfluidics**

**Credits:** 4

Fundamentals and applications of microfluidics; scaling laws; microfabrication technology; hydrodynamics and electrohydrodynamics; interfacial phenomena; capillary effects and diffusion; microvalves; micropumps; lab-on-a-chip systems; biochips. Prereq: fluid mechanics course or permission of instructor.

**Grade Mode:** Letter Grading

## **CHE #844 - 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. (Not offered every year.)

**Grade Mode:** Letter Grading

## **CHE 852 - Process Dynamics and Control**

**Credits:** 4

Dynamic behavior of chemical engineering processes described by differential equations; feedback control concepts and techniques; stability and analysis. Lab.

**Grade Mode:** Letter Grading

## **CHE 861 - 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.

**Grade Mode:** Letter Grading

## **CHE 862 - 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.

**Grade Mode:** Letter Grading

## **CHE 866 - 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.

**Grade Mode:** Letter Grading

## **CHE 898 - Chemical Engineering Project**

**Credits:** 3

Concluding experience for Master of Engineering Degree. Chemical Engineering majors only.

**Grade Mode:** Graduate Credit/Fail grading

## **CHE 899 - Master's Thesis**

**Credits:** 1-6

May be repeated to a maximum of 6 credits. Cr/F.

**Repeat Rule:** May be repeated for a maximum of 6 credits.

**Grade Mode:** Graduate Credit/Fail grading

## **CHE 900 - Seminar**

**Credits:** 0 or 1

Topics of interest to graduate students; reports of research ideas, progress, and results; lectures by outside speakers. Must be taken once for 1.00 credit. Students register for 0.00 for all other semesters in ChE graduate program. Chemical Engineering majors only. Cr/F.

**Repeat Rule:** May be repeated for a maximum of 1 credit.

**Grade Mode:** Graduate Credit/Fail grading

## **CHE 913 - Advanced Fluid Mechanics**

**Credits:** 3

Basic equations describing behavior of static and dynamic fluid systems. The equations of motions and application to laminar and turbulent flow. Momentum and energy equations for advanced problems associated with flow inside conduits. Flow of compressible fluids and boundary layer phenomena.

**Grade Mode:** Letter Grading

## **CHE 915 - Heat Transfer**

**Credits:** 3

Steady-state and transient heat conduction in solids; heat convection; analytical solutions, similarity relations, boundary layer methods; radiation.

**Grade Mode:** Letter Grading

**CHE 916 - Diffusive Mass Transfer**

**Credits:** 3

Physical aspects of diffusion; theories of diffusion in dilute gases, dense gases, liquids, and solids; surface diffusion; mixing processes. Simultaneous heat and mass transfer.

**Grade Mode:** Letter Grading

**CHE 923 - Advanced Chemical Engineering Thermodynamics**

**Credits:** 3

The multi-component open system; the volumetric and phase behavior of pure substances and of multi-component systems at physical and chemical equilibrium, fugacity and activity; thermal properties of equilibrium, chemically reacting systems; introduction to statistical thermodynamics.

**Grade Mode:** Letter Grading

**CHE 932 - Advanced Chemical Engineering Kinetics**

**Credits:** 3

Specialized applied kinetics problems; catalysis; fast reaction and shock tubes; combustion and detonation processes; non-isothermal kinetics; heat and mass transfer in non-equilibrium, chemically reacting systems.

**Grade Mode:** Letter Grading

**CHE 940 - Advanced Transport Phenomena**

**Credits:** 3

This course is a graduate level engineering course designed to review the governing relations of momentum, heat, and transfer at an advanced level for students who have already been exposed to transport at the undergraduate level. Principal concepts will be illustrated through their application to classical and practical paradigms in transport phenomena. Students will learn useful analytical methods for studying and solving steady state and unsteady state (transient) transport problems with and without fluid convection. Prereq: fluid mechanics (CHE 601), heat transfer (CHE 602), and mass transfer (CHE 703), or their equivalents.

**Grade Mode:** Letter Grading

**CHE 996 - Graduate Independent Study**

**Credits:** 1-4

Directed reading or investigation at the advanced level on topics in chemical engineering, including internships for graduate students. Only open to Chemical Engineering majors.

**Grade Mode:** Letter Grading

**CHE 999 - Doctoral Research**

**Credits:** 0

Cr/F.

**Grade Mode:** Graduate Credit/Fail grading