Chemical Engineering (CHEG)

Courses

CHEG 2113. Introduction to Chemical Engineering I. 3 Hours.
Introduction to the field of chemical engineering. Industries, careers, and the curriculum are discussed. Basic chemical engineering terms, concepts, and calculations are presented. Mass balance calculations are performed and the application of computers to chemical engineering problems is introduced. Pre- or Corequisite: CHEM 1123 or CHEM 1223. (Typically offered: Fall and Spring)

CHEG 2133. Fluid Mechanics. 3 Hours.
Analysis and design of fluid handling equipment and systems. Application of the principles of fluid statics, fluid dynamics, compressible flow, etc. Prerequisite: MATH 2584 or MATH 2584C. Pre- or Corequisite: MATH 2574 or MATH 2574C and (CHEG 2113 or BENG 2632 or BMEG 2614). (Typically offered: Fall, Spring and Summer)

CHEG 2133H. Honors Fluid Mechanics. 3 Hours.
Analysis and design of fluid handling equipment and systems. Application of the principles of fluid statics, fluid dynamics, compressible flow, etc. Prerequisite: MATH 2584 or MATH 2584C. Pre- or Corequisite: MATH 2574 or MATH 2574C and (CHEG 2113 or BENG 2632 or BMEG 2614). (Typically offered: Fall, Spring and Summer)

CHEG 2313. Thermodynamics of Single-Component Systems. 3 Hours.
A detailed study of the thermodynamic “state principles,” energy and entropy balances, and their application to the solution of problems involving single-component physical systems and processes. Prerequisite: MATH 2584. Pre- or Corequisite: CHEG 2113 or BENG 2632 or BMEG 2614. (Typically offered: Fall, Spring and Summer)

CHEG 2313H. Honors Thermodynamics of Single-Component Systems. 3 Hours.
A detailed study of the thermodynamic “state principles,” energy and entropy balances, and their application to the solution of problems involving single-component physical systems and processes. Prerequisite: MATH 2584. Pre- or Corequisite: CHEG 2113 or BENG 2632 or BMEG 2614. (Typically offered: Fall, Spring and Summer)

CHEG 3144. Heat and Mass Transfer. 4 Hours.
Applications of the principles of conduction, convection and radiation to the analysis and design of chemical processing heat transfer equipment and systems. Fundamentals of chemical diffusion and convection processes. Pre- or Corequisite: CHEG 3323. Prerequisite: CHEG 2133 with a C or above, and MATH 2584. (Typically offered: Fall and Spring)

CHEG 3144H. Honors Heat and Mass Transfer. 4 Hours.
Applications of the principles of conduction, convection and radiation to the analysis and design of chemical processing heat transfer equipment and systems. Fundamentals of chemical diffusion and convection processes. Pre- or Corequisite: CHEG 3323. Prerequisite: CHEG 2133 with a C or above, and MATH 2584. (Typically offered: Fall and Spring)

CHEG 3233L. Chemical Engineering Laboratory I. 3 Hours.
Experimental measurements of various physical properties and comparison with published values and theoretical predictions. Experimental investigation of fluid flow and thermodynamics. Interpretation of results using graphical, numerical and statistical tools, and presentation of results in written technical reports and oral briefings. Identification and quantification of sources of experimental error. Identification of relevant experimental parameters to achieve an objective. Pre- or Corequisite: CHEG 3144. Corequisite: Drill component. Prerequisite: CHEG 2133 and CHEG 2313, both with a C or above. (Typically offered: Fall and Spring)

CHEG 3253. Chemical Engineering Computer Methods. 3 Hours.
Application of computer methods to chemical engineering problems including a review of structured programming principles. Corequisite: Drill component. Pre- or Corequisite: CHEG 3144 and CHEG 3323. Prerequisite: MATH 2584. (Typically offered: Fall and Spring)

CHEG 3323. Thermodynamics of Multi-Component Systems. 3 Hours.
The use of the state principle and energy and entropy balance developed in CHEG 2313 is extended to allow processes. Physical and chemical equilibrium processes are considered in detail. Prerequisite: CHEG 2131 with a C or above, and MATH 2574. (Typically offered: Fall and Spring)

CHEG 3323H. Honors Thermodynamics of Multi-Component Systems. 3 Hours.
The use of the state principle and energy and entropy balance developed in CHEG 2131 is extended to allow processes. Physical and chemical equilibrium processes are considered in detail. Prerequisite: Honors standing, CHEG 2311 with a C or above, and MATH 2574. (Typically offered: Fall and Spring)

CHEG 3333. Chemical Engineering Reactor Design. 3 Hours.
Principles of kinetics of homogeneous and heterogeneous reactions, catalysis, and reactor design with applications, drawn from industrial processes. Pre- or Corequisite: CHEG 3253. Prerequisite: CHEG 3323, with a C or above. (Typically offered: Fall and Spring)

CHEG 3333H. Honors Chemical Engineering Reactor Design. 3 Hours.
Principles of kinetics of homogeneous and heterogeneous reactions, catalysis, and reactor design with applications, drawn from industrial processes. Pre- or Corequisite: CHEG 3253. Prerequisite: Honors standing, and CHEG 3323 with a C or above. (Typically offered: Fall and Spring)

CHEG 3713. Chemical Engineering Materials Technology. 3 Hours.
Selection of metals, polymers and ceramics for service in process conditions (including corrosion). In addition to static strains on materials, specialized materials such as semiconductors, composites, and nano-materials are studied. The relationship between molecular structure and macroscopic properties is emphasized including processing and manufacture. Prerequisite: CHEG 3323 with a C or above, CHEM 3603, and PHYS 2054. (Typically offered: Spring)

CHEG 4163. Separation Processes. 3 Hours.
Applications of chemical engineering design to stagewise and continuous separations in systems approaching equilibrium. Prerequisite: CHEG 3144 with a C or above. (Typically offered: Fall and Spring)

CHEG 4163H. Honors Separation Processes. 3 Hours.
Applications of chemical engineering design to stagewise and continuous separations in systems approaching equilibrium. Prerequisite: Honors standing and CHEG 3144 with a C or above. (Typically offered: Fall and Spring)

CHEG 4332L. Chemical Engineering Laboratory II. 2 Hours.
Experimental investigations of mass transfer and kinetics/reactor design. Special attention to attaining a high order of accuracy and to presenting results in complete written reports, with emphasis on quality rather than quantity work performed. Pre- or Corequisite: CHEG 3333 and CHEG 4163. Corequisite: Drill component. Prerequisite: CHEG 3233L with a C or above. (Typically offered: Fall and Spring)
CHEG 4413. Chemical Engineering Design I. 3 Hours.
Principles of cost estimation, profitability, economic analysis, and economic balances as practiced in the chemical process industries. Special emphasis on the solution of problems involving the combination of engineering principles and economics. Corequisite: Drill component. Pre- or Corequisite: CHEG 4163. Prerequisite: CHEG 3144 with a C or above, CHEG 3333 with a C or above, and (ECON 2013 or ECON 2143). (Typically offered: Fall and Spring)

CHEG 413H. Honors Chemical Engineering Design I. 3 Hours.
Principles of cost estimation, profitability, economic analysis, and economic balances as practiced in the chemical process industries. Special emphasis on the solution of problems involving the combination of engineering principles and economics. Corequisite: Drill component. Pre- or Corequisite: CHEG 4163. Prerequisite: Honors standing, CHEG 3144 with a C or above, CHEG 3333 with a C or above, and (ECON 2013 or ECON 2143). (Typically offered: Fall and Spring)

This course is equivalent to CHEG 4413.

CHEG 4423. Automatic Process Control. 3 Hours.
Application of mathematical modeling methods to the description of transient phenomena of interest to process engineers. Modes of control and principles of feedback control are introduced with applications to process engineering problems. Pre- or Corequisite: CHEG 4163. Prerequisite: CHEG 3253 with a C or above. (Typically offered: Spring)

CHEG 423H. Honors Automatic Process Control. 3 Hours.
Application of mathematical modeling methods to the description of transient phenomena of interest to process engineers. Modes of control and principles of feedback control are introduced with applications to process engineering problems. Pre- or Corequisite: CHEG 4163. Prerequisite: Honors standing, and CHEG 3253 with a C or above. (Typically offered: Spring)

This course is equivalent to CHEG 4423.

CHEG 4443. Chemical Engineering Design II. 3 Hours.
Responsibility for decision making is placed on the students in the solution of a comprehensive, open ended problem based on an industrial process. Both formal oral and formal written presentation of results are required. Students are selected for participation in some sections of the course based on academic performance, honors standing and instructor recommendations. Corequisite: Drill component. Prerequisite: CHEG 4413 with a C or above. (Typically offered: Fall and Spring)

CHEG 443H. Honors Chemical Engineering Design II. 3 Hours.
Responsibility for decision making is placed on the students in the solution of a comprehensive, open ended problem based on an industrial process. Both formal oral and formal written presentation of results are required. Students are selected for participation in some sections of the course based on academic performance, honors standing and instructor recommendations. Corequisite: Drill component. Prerequisite: CHEG 4413 with a C or above. (Typically offered: Fall and Spring)

This course is equivalent to CHEG 4443.

CHEG 4813. Chemical Process Safety. 3 Hours.
Application of chemical engineering principles to the study of safety, health, and loss prevention. Fires and explosions, hygiene, toxicology, hazard identification, and risk assessment in the chemical process industries. Corequisite: Drill component. Prerequisite: CHEG 3144 and CHEG 3323, both with a C or above. (Typically offered: Fall)

CHEG 4813H. Honors Chemical Process Safety. 3 Hours.
Application of chemical engineering principles to the study of safety, health, and loss prevention. Fires and explosions, hygiene, toxicology, hazard identification, and risk assessment in the chemical process industries. Corequisite: Drill component. Prerequisite: Honors standing, CHEG 3323 and CHEG 3144 both with a C or above. (Typically offered: Fall)

This course is equivalent to CHEG 4813.

CHEG 488V. Special Problems. 1-6 Hour.
Special problems. Prerequisite: Senior standing. (Typically offered: Fall, Spring and Summer) May be repeated for up to 6 hours of degree credit.

CHEG 5013. Membrane Separation and System Design. 3 Hours.
Theory and system design of cross flow membrane process—reverse osmosis, nanofiltration, ultrafiltration, and microfiltration—and applications for pollution control, water treatment, food and pharmaceutical processing. (Typically offered: Irregular)

CHEG 5043. Colloid and Interface Science. 3 Hours.
This course aims to provide essential knowledge about surface, interface, and molecular self-organization. At the end of this course students should understand (i) basic concepts to describe phenomena at surfaces, (ii) molecular self-organization, and (iii) basic techniques for characterization of surfaces and interfaces. (Typically offered: Spring Odd Years)

CHEG 5113. Transport Processes I. 3 Hours.
Fundamental concepts and laws governing the transfer of momentum, mass, and heat. (Typically offered: Fall)

CHEG 5133. Advanced Reactor Design. 3 Hours.
Applied reaction kinetics with emphasis on the design of heterogeneous reacting systems including solid surface catalysis, enzyme catalysis, and transport phenomena effects. Various types of industrial reactors, such as packed bed, fluidized beds, and other non-ideal flow systems are considered. (Typically offered: Spring)

CHEG 5273. Corrosion Control. 3 Hours.
Qualitative and quantitative introduction to corrosion and its control. Application of the fundamentals of corrosion control in the process industries is emphasized. (Typically offered: Spring)

CHEG 5333. Advanced Thermodynamics. 3 Hours.
Methods of statistical thermodynamics, the correlation of classical and statistical thermodynamics, and the theory of thermodynamics of continuous systems (non-equilibrium thermodynamics). (Typically offered: Fall)

CHEG 5443. Chemical Engineering Design II. 3 Hours.
A capstone design class designed for graduate students who do not have an engineering degree. Responsibility for decision making is placed on the students in the solution of a comprehensive, open ended problem based on an industrial process. Both formal oral and formal written presentation of results are required. Students may not receive credit for both CHEG 4443 and CHEG 5443. Prerequisite: Graduate standing. (Typically offered: Fall and Spring)

CHEG 5513. Biochemical Engineering Fundamentals. 3 Hours.
An introduction to bioprocessing with an emphasis on modern biochemical engineering techniques and biotechnology. Topics include: basic metabolism (procaryote and eucaryote), biochemical pathways, enzyme kinetics (including immobilized processes), separation processes (e.g. chromatography) and recombinant DNA methods. Material is covered within the context of mathematical descriptions (calculus, linear algebra) of biochemical phenomenon. (Typically offered: Spring Even Years)

CHEG 5733. Polymer Science and Engineering. 3 Hours.
Synthesis, characterization, and application for polymers and multi-component polymer materials are presented. Topics include polymer science principles, commercial and research practices, processing, and recycling. (Typically offered: Irregular)
CHEG 5773. Medical Applications of Membranes Theory, Current Uses, and Development Areas. 3 Hours.
The course will cover most present-day medical products, treatments, and surgical equipment that rely on membrane transport and/or separation to function effectively. Membranes or membrane devices are used when certain human organs stop working or lose some degree of effectiveness. Those that will be covered in this course include the kidney, the pancreas, the lungs, the skin, and the eye. Localized, controlled-release of medications is also an area where membranes are used in medicine and this area will be described also. Along with dialysis, other external membrane treatment processes such as membrane plasmapheresis (a process whereby a membrane is used to separate blood cells from plasma and thereby opening the door for more effectively treating the cells or plasma separately outside of the body) will be discussed. (Typically offered: Irregular)

CHEG 5801. Graduate Seminar. 1 Hour.
Students hear and present oral presentations on innovations in a variety of chemical engineering subjects with special emphasis on new developments. Prerequisite: Graduate standing. (Typically offered: Fall and Spring) May be repeated for up to 12 hours of degree credit.

CHEG 588V. Special Problems. 1-6 Hour.
Opportunity for individual study of an advanced chemical engineering problem not sufficiently comprehensive to be a thesis. Prerequisite: Graduate standing. (Typically offered: Fall, Spring and Summer) May be repeated for up to 6 hours of degree credit.

CHEG 600V. Master's Thesis. 1-6 Hour.
Master's Thesis. Prerequisite: Graduate standing. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.

CHEG 6123. Transport Processes II. 3 Hours.
Continuation of CHEG 5113. Prerequisite: CHEG 5113. (Typically offered: Spring)

CHEG 688V. Special Topics in Chemical Engineering. 1-3 Hour.
Advanced study of current Chemical Engineering topics not covered in other courses. Prerequisite: Doctoral students only. (Typically offered: Fall, Spring and Summer) May be repeated for up to 3 hours of degree credit.

CHEG 700V. Doctoral Dissertation. 1-18 Hour.
Doctoral Dissertation. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.