Chemical Engineering (CHEG)

Courses

CHEG 21103. 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 14203 or CHEM 12283. (Typically offered: Fall and Spring)

CHEG 21303. Fluid Mechanics. 3 Hours.
Analysis and design of fluids handling equipment and systems. Application of the principles of fluid statics, fluid dynamics, compressible flow, etc. Prerequisite: MATH 25804 or MATH 25804. Pre- or Corequisite: MATH 26004 or MATH 26004 and (CHEG 21103 or BENG 26302 or BMEG 26104). (Typically offered: Fall, Spring and Summer)

CHEG 213H3. Honors Fluid Mechanics. 3 Hours.
Analysis and design of fluids handling equipment and systems. Application of the principles of fluid statics, fluid dynamics, compressible flow, etc. Prerequisite: MATH 25804 or MATH 25804. Pre- or Corequisite: MATH 26004 or MATH 26004 and (CHEG 21103 or BENG 26302 or BMEG 26104). (Typically offered: Fall, Spring and Summer)

CHEG 23103. 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 25804. Pre- or Corequisite: CHEG 21103 or BENG 26302 or BMEG 26104. (Typically offered: Fall, Spring and Summer)

CHEG 231H3. 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 25804. Pre- or Corequisite: CHEG 21103 or BENG 26302 or BMEG 26104. (Typically offered: Fall, Spring and Summer)

CHEG 31404. 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 diffusional and convection processes. Pre- or Corequisite: CHEG 33203. Prerequisite: CHEG 21303 with a C or above, and MATH 25804. (Typically offered: Fall and Spring)

CHEG 314H4. 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 diffusional and convection processes. Pre- or Corequisite: CHEG 33203. Prerequisite: CHEG 21303 with a C or above, and MATH 25804. (Typically offered: Fall and Spring)

CHEG 32303. 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 31404. Corequisite: Drill component. Prerequisite: CHEG 21303 and CHEG 23103, both with a C or above. (Typically offered: Fall and Spring)

CHEG 32503. 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 31404 and CHEG 33203. Prerequisite: MATH 25804. (Typically offered: Fall and Spring)

CHEG 33203. Thermodynamics of Multi-Component Systems. 3 Hours.
The use of the state principle and energy and entropy balance developed in CHEG 23103 is extended to allow processes. Physical and chemical equilibrium processes are considered in detail. Prerequisite: CHEG 23103 with a C or above, and MATH 26004. (Typically offered: Fall and Spring)

CHEG 332H3. Honors Thermodynamics of Multi-Component Systems. 3 Hours.
The use of the state principle and energy and entropy balance developed in CHEG 23103 is extended to allow processes. Physical and chemical equilibrium processes are considered in detail. Prerequisite: Honors standing, CHEG 23103 with a C or above, and MATH 26004. (Typically offered: Fall and Spring)

CHEG 33303. 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 32503. Prerequisite: CHEG 33203, with a C or above. (Typically offered: Fall and Spring)

CHEG 333H3. 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 32503. Prerequisite: Honors standing, and CHEG 33203 with a C or above. (Typically offered: Fall and Spring)

CHEG 37103. 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 33203 with a C or above, CHEM 36053, and PHYS 20304. (Typically offered: Spring)

CHEG 371H3. Honors 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 33203 with a C or above, CHEM 36053, and PHYS 20304 and Honors Standing. (Typically offered: Spring)

CHEG 41603. Separation Processes. 3 Hours.
Applications of chemical engineering design to stagewise and continuous separations in systems approaching equilibrium. Prerequisite: CHEG 31404 with a C or above. (Typically offered: Fall and Spring)

CHEG 416H3. Honors Separation Processes. 3 Hours.
Applications of chemical engineering design to stagewise and continuous separations in systems approaching equilibrium. Prerequisite: Honors standing and CHEG 31404 with a C or above. (Typically offered: Fall and Spring)

CHEG 43302. 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 33303 and CHEG 41603. Corequisite: Drill component. Prerequisite: CHEG 32303 with a C or above. (Typically offered: Fall and Spring)

CHEG 44103. 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 41603. Prerequisite: CHEG 31404 with a C or above, CHEG 33303 with a C or above, and (ECON 21003 or ECON 21403). (Typically offered: Fall and Spring)

CHEG 441H3. 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 41603. Prerequisite: Honors standing, CHEG 31404 with a C or above, CHEG 33303 with a C or above, and (ECON 21003 or ECON 21403). (Typically offered: Fall and Spring)

CHEG 44203. 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 41603. Prerequisite: CHEG 32503 with a C or above. (Typically offered: Spring)

CHEG 442H3. 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 41603. Prerequisite: Honors standing, and CHEG 32503 with a C or above. (Typically offered: Spring)

CHEG 44403. 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 44103 with a C or above. (Typically offered: Fall and Spring)

CHEG 444H3. 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 44103 with a C or above. (Typically offered: Fall and Spring)

CHEG 48103. 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 31404 and CHEG 33203, both with a C or above. (Typically offered: Fall)

CHEG 481H3. 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 33203 and CHEG 31404 both with a C or above. (Typically offered: Fall)

CHEG 4880V. 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 49203. Introduction to Sustainable Process Engineering. 3 Hours.
This course considers the role of engineers in the pursuit of a sustainable future. Broad topics will be addressed including Principles of Sustainability, Sustainable Materials, Renewable Energies, Life Cycle Analyses, and Sustainable Process Engineering Design Principles. The course will include lectures, open-ended discussions, guest speakers, and case studies. Students may not receive credit for both CHEG 49203 and CHEG 59203. Prerequisite: CHEG 23103 or MEEG 24003. (Typically offered: Irregular)

CHEG 50103. 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 50403. 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 51103. Transport Processes I. 3 Hours.
Fundamental concepts and laws governing the transfer of momentum, mass, and heat. (Typically offered: Fall)

CHEG 51303. 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 52703. 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 53303. 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 54403. 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 44403 and CHEG 54403. Prerequisite: Graduate standing. (Typically offered: Fall and Spring)

CHEG 55103. 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 57303. 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 57703. 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 58001. 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 5880V. 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 59203. Introduction to Sustainable Process Engineering. 3 Hours.
This course considers the role of engineers in the pursuit of a sustainable future. Broad topics will be addressed including Principles of Sustainability, Sustainable Materials, Renewable Energies, Life Cycle Analyses, and Sustainable Engineering Design Principles. The course will include lectures, open-ended discussions, guest speakers, and case studies. Students may not receive credit for both CHEG 49203 and CHEG 59203. (Typically offered: Irregular)

CHEG 6000V. 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 61203. Transport Processes II. 3 Hours.
Continuation of CHEG 51103. Prerequisite: CHEG 51103. (Typically offered: Spring)

CHEG 6880V. 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 7000V. Doctoral Dissertation. 1-18 Hour.
Doctoral Dissertation. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.