CHEMICAL ENGINEERING (CHEN)

CHEN 2650   Computer Methods in Chemical Engineering   2 s.h.
Application of computational software packages and spreadsheets to solve chemical engineering problems. Utilization of process simulation packages. Real-time computing applications in laboratory automation.
Prereq.: ENGR 1550, ENGR 1550H or consent of instructor.

CHEN 2683   Chemical Engineering Principles 1   3 s.h.
Engineering units and dimensions. Hydrostatics. Material balances for non-reacting and reacting processes. Ideal and non-ideal gas relationships. Ideal multi-phase equilibrium calculations.
Prereq.:MATH 1571, MATH 1571H or MATH 1585H, CHEM 1515.

CHEN 2684   Chemical Engineering Principles 2   3 s.h.
Energy balances on reacting and non-reacting processes. Utilization of energy balances on multi-phase processes. Mass and energy balances on transient processes.
Prereq.: CHEN 2683.

CHEN 2688   Energy Assessment   3 s.h.
Concept of energy assessment. Technology of energy production that includes coal gasification, liquefaction, magnetohydrodynamics, utilization of shale oil, solar, geothermal, and chemical energy. Nuclear energy utilization. Fuel from wastes. Energy resource distribution and future supply and demand. Simple calculations relating to fuel saving, production, and consumption. Primarily for non-engineering students.

CHEN 3700   Measurements and Instrumentation   3 s.h.
Sensors, measurements, and instrumentation are the cornerstones of hands-on learning in engineering, which prepares students for careers and advanced research. This course is much more about measurement science than about computer science or scientific computing. It helps students make the most productive use of computers in the engineering research laboratory. Understand and implement the techniques of computer-based real-time instrumentation and design operational and analytical software using Laboratory Virtual Instrument Engineering Workbench (LabVIEW) for Data Acquisition (DAQ) device and simulation of engineering laboratory measurement instruments. Measure physical and chemical properties with various sensors and interfacing LabVIEW and DAQ device.
Prereq.: CHEN 2683.

CHEN 3718   Women, Science, and Technology   3 s.h.
An overview of the role women have played in scientific and technological advances. Problems unique to women entering scientific professions will be addressed, information about scientific and technical careers and job opportunities and contacts with professionals in the community will be provided.
Prereq.: ENGL 1550.

CHEN 3721   Engineering Plastics   3 s.h.
Preparation, characterization, manufacture, properties and applications of commercial polymers.
Prereq.: CHEN 2684 and CHEM 3719; or consent of instructor.

CHEN 3726   Elementary Nuclear Reactor Engineering   3 s.h.
Basic engineering science to serve as background material for nuclear reactor design. Nuclear fission as an energy source. Reactor use and classification. Comprehensive discussion of reactor design problems such as neutron distribution in the core, type of moderator, heat removal, and radiation protection.
Prereq.: MATH 2673, PHYS 2610.

CHEN 3771   Chemical Engineering Thermodynamics 1   3 s.h.
Development of the concepts and formalisms of thermodynamics and their applications to chemical engineering systems. Real and ideal behavior of single and multicomponent systems. Introduction to the thermodynamics of phase equilibria. Analysis and design of thermal systems. Additional topics include applications in transport phenomena and plant design.
Prereq.: MATH 2673 or MATH 2686H and CHEN 2684.

CHEN 3785L   Transport Phenomena Laboratory   1 s.h.
Experimental studies of transport properties and momentum, energy and mass transfer using industrial type equipment. Correlation of data and comparison with theory. Oral presentations and preparation of technical reports. Three hours laboratory.
Prereq.: CHEN 3786 or concurrent.

CHEN 3786   Transport Phenomena 1   4 s.h.
Mathematical formulation of conversion laws. Dimensional analysis. Mechanism and fundamentals of momentum and energy transfer with selected applications to analysis and design of chemical engineering equipment. Three hours lecture and three hours computational lab per week.
Prereq.: MATH 2673 or MATH 2686H and CHEN 2684.

CHEN 3787   Transport Phenomena 2/Unit Operations 1   3 s.h.
Mass transfer processes. Diffusional operations and separation processes with emphasis on evaporation, humidification and drying. Derivation of design equations from mass and energy balances, and application to equipment design. Solution of simultaneous differential equations of mass, momentum, and energy.
Prereq.: CHEN 3786.

CHEN 3787L   Unit Operations Laboratory 1   1 s.h.
Experiments in absorption, cascade operations, reaction kinetics, mixing and other chemical engineering operations employing industrial and pilot plant size equipment and instrumentation. Treatment of experimental data, correlations and comparison with theory. Oral presentations and preparation of technical reports. Three hour laboratory.
Prereq.: CHEN 3787.

CHEN 4801   Chemical Engineering Projects   3 s.h.
Chemical engineering projects under the guidance of a faculty member. Literature search, design and construction of apparatus, experimentation and preparation of a comprehensive report.
Prereq.: Consent of instructor.

CHEN 4802   Chemical Engineering Projects   3 s.h.
Chemical engineering projects under the guidance of a faculty member. Literature search, design and construction of apparatus, experimentation and preparation of a comprehensive report.
Prereq.: Consent of instructor.

CHEN 4803   Chemical Engineering Projects   3 s.h.
Chemical engineering projects under the guidance of a faculty member. Literature search, design and construction of apparatus, experimentation and preparation of a comprehensive report.
Prereq.: Consent of instructor.

CHEN 4815   Unit Operations 2   3 s.h.
Gas absorption and desorption, interphase mass transfer processes, liquid extraction and leaching. Physical separation processes including filtration, settling, and size reduction. Derivation of the design equations for the above processes, and applications of the design equations to equipment design.
Prereq.: CHEN 3787.

CHEN 4815L   Unit Operations Laboratory 2   1 s.h.
Experiments in absorption, cascade operations, reaction kinetics, mixing and other chemical engineering operations employing industrial and pilot plant size equipment and instrumentation. Treatment of experimental data, correlations and comparison with theory. Oral presentations and preparation of technical reports. Three hour laboratory.
Prereq.: CHEN 4815.

CHEN 4815R   Unit Operations 2 Applications   1 s.h.
Utilizing computer programs for gas absorption and desorption, interphase mass transfer processes, liquid extraction and leaching. Includes applications of the design equations to equipment design.
Prereq.: CHEN 3787.

CHEN 4822   Reinforced Polymer Structures   3 s.h.
Survey of raw materials, manufacturing methods, and design of products utilizing reinforcing materials combined with an elastomer or polymer binder.
Prereq.: CHEN 2684 or consent of instructor.

CHEN 4840   Biochemical Engineering Fundamentals   3 s.h.
Design of biological reactors, bioremediation schemes, methods for the purification and mass production of chemical species from living organisms or cultures, extraction, and fermentation. Technologies and processing of recombinant DNA, antibiotics, antibodies, vitamins, steroids, and methane are included. Essentials of microbiology, biochemistry, and genetics will precede industrial applications. Prereq.: junior standing.
Prereq.: CHEN 2684 or consent of instructor.

CHEN 4880   Chemical Reactor Design 1   3 s.h.
Chemical reaction equilibria. Theoretical developments and methods of interpreting experimental data pertaining to chemical kinetics. General design principles and construction features of reactors with application of these principles to the design of specific reactors.
Prereq.: CHEN 3771.

CHEN 4880R   Reactor Design Applications   1 s.h.
Utilizing computer programs for determination of chemical reaction equilibria, chemical kinetics, and designing reactors.
Prereq.: CHEN 3771.

CHEN 4881   Chemical Reactor Design 2   3 s.h.
Chemical reaction equilibria. Theoretical developments and methods of interpreting experimental data pertaining to chemical kinetics. General design principles and construction features of reactors with application of these principles to the design of specific reactors.
Prereq.: CHEN 4880.

CHEN 4882   Process Dynamics   3 s.h.
Introduction to automatic control and control loop concepts. Laplace transform techniques. Linear open-loop and closed-loop systems. Root-locus and frequency response methods. Design of control systems.
Prereq.: CHEN 3786.

CHEN 4887   Process and Plant Design 1   3 s.h.
An examination of engineering economic analysis to include: cost estimation, profitability, optimum design, principles of fixed and operating costs, materials and site selection, and general and specialized design techniques.
Prereq.: CHEN 3787 Minimum grade of C, CHEN 4880 Minimum grade of C and unrecalculated GPA of 2.0 or better in major courses.

CHEN 4888   Process and Plant Design 2   3 s.h.
The application of chemical engineering and cost principles to the component design and selection of process equipment. The application of chemical engineering and cost principles to the design of chemical plants and processes including societal aesthetic, environmental, and safety considerations.
Prereq.: CHEN 4887 minimum grade of C.
Gen Ed: Capstone.

CHEN 5800   Special Topics   1-4 s.h.
Special topics and new developments in chemical engineering. Subject matter, credit hours, and special prerequisites to be announced in advance of each offering.
Prereq.: Consent of instructor.

CHEN 5805   Principles of Biomedical Engineering   3 s.h.
Application of engineering principles and methods of analysis to processes in the human body. Rheological, physical and chemical properties of body fluids. Dynamics of the circulatory system. The human thermal system. Transport through cell membranes. Analysis and design of artificial organs.
Prereq.: CHEN 2684 or consent of instructor.

CHEN 5811   Advanced Transport Phenomena   3 s.h.
Development of basic differential balance equations for mass, momentum and energy. Analytical and approximate solutions to the equation of change with application to the analysis of common engineering problems.
Prereq.: CHEN 3786.

CHEN 5820   Industrial Pollution Control   3 s.h.
Types, sources and effects of industrial and hazardous waste; principles of industrial and hazardous waste control; discussion and design of biological, physical, and chemical treatment processes.
Prereq.: CHEN 2684 or consent of instructor.

CHEN 5821   Fundamentals of Polymer Science   3 s.h.
The survey of polymerization mechanisms, polymer structure-property relationships, transport properties, flammability-related plasticizers and solvents as well as design applications.
Prereq.: CHEN 2684 or consent of instructor.

CHEN 5830   Nuclear Reactors   3 s.h.
Neutron interactions and scattering; moderation ratio, the steady state reactor core and four factor equation, the diffusion equation for various reactor geometries and the reflected reactor core.
Prereq.: CHEN 3726 or consent of instructor.

CHEN 5835   Introduction to Nuclear Fusion   3 s.h.
Fusion reactors; the kinetics of fusion reactions. Plasma confinement technology.
Prereq.: CHEN 3726.

CHEN 5845   Corrosion Engineering   3 s.h.
Introduction to causes and forms of corrosion, corrosion rate calculations, electrode potentials, electrochemistry, corrosion testing, and effects of corrosion on mechanical properties. Theory and use of corrosion inhibition methods.
Prereq.: CHEN 2684.

CHEN 5850   Industrial Processes   3 s.h.
A fundamental approach to the design of industrial chemical processes. Emphasis upon flow-charting, chemical reactions, separations involved, thermodynamics, and economic considerations. Food and pharmaceutical processing is a major focus.
Prereq.: CHEN 2684 or consent of instructor.

CHEN 5854   Corrosion Engineering   3 s.h.
Introduction to causes and forms of corrosion, corrosion rate calculations, electrode potentials, electro-chemistry, corrosion testing, and effects of corrosion on mechanical properties. Theory and use of corrosion inhibition methods.
Prereq.: Junior or Senior Standing or Approval of the Instructor.

CHEN 5883   Mathematical Methods in Chemical Engineering   3 s.h.
The applications of advanced mathematics to the solution of chemical engineering problems. Topics covered include treatment and interpretation of engineering data, modeling of chemical engineering systems and formulation of ordinary and partial differential equations governing chemical engineering operations and their solutions by use of numerical and analytical techniques.
Prereq.: CHEN 3786.

CHEN 5886   Nuclear Reactor Design   3 s.h.
The steady state reactor core; four-factor equation, resonance escape probability, neutron flux distribution in various geometrics, two-group and multigroup theories. Transient reactor behavior and control; effect of delayed neutrons, fission product poisoning, nuclear fuels, nuclear heat transfer and burnout problems, reactor economy; fuel burnup and power cost. Thermal breeder and fast reactors. Neutron flux distribution measurements. Radiation detection and monitoring.
Prereq.: CHEN 3726 or consent of instructor.

CHEN 6981   Advanced Chemical Reaction Engineering   3 s.h.
Advances topics in chemical reaction engineering including non-elementary reaction kinetics, reactor design for autocatalytic reactions, temperature and energy effects in chemical reactions, heterogeneous catalysis, catalyst preparation, fabrication and activation.
Prereq.: CHEN 4880.

CHEN 6983   Modern Power Sources   3 s.h.
Analytical and descriptive study of modern power plants. Combustion and environmental problems with fossil-fueled power plants. Electromagnetic circuits and devices with emphasis on the principles of electromechanical energy conversions.

CHEN 6984   Nuclear Fission and Fusion Power Sources   3 s.h.
Energy available from fission and fusion nuclear reactions, on setting and maintaining chain reaction. Mechanical and electromagnetic confinement techniques. Reactor design, heat removal, and safety problems.

CHEN 6985   Electromechanical Motion Devices   3 s.h.
Thermodynamics of batteries, and electric and fuel cells. Power from nuclear isotopes. Features common to rotating electromagnetic fields. Analysis and design of electromechanical power components.

CHEN 6990   Thesis   1-9 s.h.
Research selected and supervised by departmental advisor. May be repeated for a maximum of nine semester hours.
Prereq.: Acceptance by departmental committee.