CME (Chemical Engineering)

CME 201 Chemical Engineering Calculations I
Lec. 4./Credit 4.

An introduction to Chemical Engineering. Treatment of system of units, unit conversions, stoichiometric and composition relationships; material balances in nonreactive and reactive systems; gas behavior; multiphase systems, vapor pressure and solubility. Concept of energy, introduction to first law of thermodynamics; energy balances in non-reactive and reactive processes; applications in simultaneous material and energy balances; transient processes; introduction to commercial process simulators. Corequisite: CHE 202, MAT 152 and knowledge of a programming language.

CME 202

Chemical Engineering Calculations II
Lec. 3./Credit 3.

Concept of energy, introduction to first law of thermodynamics; energy balances in non-reactive and reactive processes; applications in simultaneous material and energy balances; transient processes; introduction to commercial process simulators. Prerequisite: CME 201.

CME 301 Staged Operations Lec. 3./Credit 3.

Unified treatment of equilibrium-stage processes and mass transfer operations. Introduction of mass transfer separation operations used in countercurrent multistage equipment for distillation, extraction, leaching and absorption. Corequisite: CME 304 and CME 402.

CME 302 Transport Phenomena Lec. 3./Credit 3.

This course expands the student's understanding of transport phenomena. Particular emphasis is placed on developing and applying differential and integral balances. Prerequisite: EGR 216, CME 305.

CME 303-304 Transport Phenomena I-II Lec. 3./Credit 3.

This course sequence introduces the student to the general property balance equation and to various transport mechanisms for momentum, energy, and mass. Differential and integral momentum, energy, and mass balances will be derived and applied to engineering problems involving steady and transient transport. Prerequisites: PHY 204, MAT 260 and CME 201 for CME 303. Prerequisites: CME 202 and CME 303 for CME 304. A grade of "C" or better is required in CME 303 before enrolling in CME 304.

CME 305

Chemical Engineering Calculations
Lec. 4./Credit 4.

This course provides an introduction to chemical engineering. The concepts introduced in EGR 215 and EGR 216 are applied to chemical processes to obtain stream properties. Prerequisite: EGR 216.

CME 306

Separation Operations

Lec. 3./Credit 3.

This course provides an introduction to equilibrium stage and continuous contact mass transfer operations. Design and operation of gas absorption, distillation, extraction, and membrane separation equipment are emphasized. Prerequisite: CME 202, 304 and 307.

CME 307 Chemical Engineering Thermodynamics
Lec. 4./Credit 4.

This course covers the application of thermodynamics to fluid mixtures, solutions, phase equilibria and chemical reaction equilibria. Second law and production of power from heat is also covered. Prerequisite CME 303.

CME 308 Chemical Reaction Engineering Lec. 3./Credit 3.

This course covers the acquisition and analysis of kinetic data for chemical reactions and the design of reactors of multiple reactor systems to carry out industrial reactions. Prerequisite: CME 307. Corequisite: CME 302.

CME 311-312 Unit Operations I-II Lec. 1./Lab 6./Credit 3.

Fundamental principles underlying Chemical Engineering operations and processes involving the transfer of momentum, heat and mass. Application of these concepts in the Chemical Engineering laboratory to realistic problems. Momentum transfer fluid flow in pipes and motion of particles in fluids. Heat transfer evaporation and heat exchange by conduction, convection and radiation, heat exchange equipment. Mass transfer equilibrium stage and differential mass transfer concepts. Prerequisite: CME 303 and CME 304, respectively.

CME 401 Engineering Thermodynamics I Lec. 2./Credit 2.

Basic definitions and development of the first law and second law of thermodynamics as it applies to non-flow and steady-flow processes; pressure-volume, temperature behavior of fluids; power and refrigeration processes. Prerequisite: CME 202, MAT 152, and CHE 402.

CME 402 Engineering Thermodynamics II Lec. 3./Credit 3.

Application of thermodynamics to fluid mixtures, solutions, vapor-liquid equilibrium, phase diagrams and chemical reaction equilibrium. Prerequisite: CHE 401.

CME 403 Chemical Reactor Design Lec. 3./Credit 3.

Homogeneous reactions; derivation of rate expressions from experimental data; design of ideal reactors for isothermal and nonisothermal operations; applications of reactor design to multiple reactor and reaction systems; heterogeneous catalysis. Prerequisites: CME 304 and CME 402.

CME 405 Process Control Lec. 3./Credit 3.

This course involves the analysis and design of chemical process control systems; feedback and feed forward controllers for a single process; stability, tuning and simulation of PID controllers. Prerequisites: CME 304, EGR 208.

CME 407-408 Chemical Process Design I and II
Lec. 2./Lab 3./Credit 3.

This two-course sequence introduces the systems viewpoint in process design and discusses process synthesis and analysis, screening of alternatives, and economic decision making. Special emphasis is placed on process simulation and use of commercial process simulators in process design. Several small exercises and one comprehensive design project. Prerequisites: CME 202, CME 304, CME 306, CME 308 for CME 407. A grade of "C" or better is required before enrolling in CME 408.

CME 409 Data Analysis and Design of Experiments
Lec. 1./Credit 1.

This course introduces the student to the application of several statistical topics of practical interest. Prerequisite: CME 308.

CME 411-412 Chemical Engineering Labs I-II
Lab 6./Credit 2.

This is a two-semester laboratory course sequence involving experiments covering the application of fundamental principles of chemical engineering to unit operations, chemical reaction engineering, and process control. Prerequisite: CME 304, CME 306, CME 308. Corequisite: CME 405, CME 409.

CME 420 Chemical Engineering Seminar Lec. 1./Credit 1.

Presentation and discussion of selected topics in chemical engineering, professionalism, career and graduate school. Each student is assigned topics of current importance to chemical engineering to prepare and present a seminar. Prerequisites: CME 304, CME 308. CME Undergraduate/Graduate

CME 503 Heterogeneous Catalysis and
Reaction Engineering Lec. 3./Credit 3.

To introduce the principles and applications of heterogeneous catalysis. Catalyst preparation and characterization. Adsorption; heterogeneous kinetics. Diffusion and reaction in porous catalyst particles. Applications to design of catalytic chemical reactors. Industrial catalytic processes. Prerequisites: CME 304, CME 403 (or CME 302, CME 308).

CME 506 Fundamentals of Combustion Lec. 3./Credit 3.

To teach fundamental processes occurring in combustion and related phenomena. Topics covered include a review of thermodynamics, kinetics and compressible gas dynamics, equations of the flow of reactive gas mixtures, chain reactions, chemical aspects of explosions, detonations and deflagrations, premixed flames (structure and propagation of laminar and turbulent flames, ignition, quenching, flashback and flowoff), laminar and turbulent diffusion flames, fluidized combustion, combustion safety. Prerequisites: CME 303, CME 402 (or CME 302, CME 307).

CME 507 Biochemical Engineering Lec. 3./Credit 3.

To impart an integrated knowledge of biological properties and principles, and of Chemical Engineering methodology. Topics covered include basics of microbiology and biochemical, enzyme technology, immobilized enzymes, metabolic stoichiometry and energetics, molecular genetics, mathematical models for single species, structured models, transport phenomena in bioprocess systems, bioreactors, product recovery operations, control of biochemical processes, models of mixed populations of cells. Prerequisite: CME 301 (or CME 306); Corequisite: CME 308 (or CME 403).

CME 510 Modeling of Chemical Engineering Processes Lec. 3./Credit 3.

A unified approach to mathematical description of Chemical Engineering systems. Classification of resulting models. Solution by various analytical methods. Determination of numerical values of model parameters. Prerequisite: CME 302 (or CME 304); Corequisite: CME 308 (or CME 403).

CME 512 Optimization Lec. 3./Credit 3.

To teach mathematical programming techniques and their application to Chemical Engineering. Topics covered include modeling and formulation of optimization problems, basics of optimization theory and methods (linear and constrained nonlinear programming, unconstrained optimization, optimization of discrete processes), applications of optimization (heat exchanger and separation networks, chemical reactor optimization, optimization in large-scale plant design and operation), easy-to-use computer packages and optimization with a process simulator. Corequisite: CME 407.

CME 521 Coal Science and Application Lec. 3./Credit 3.

Physical and chemical properties of coal, methods of analysis and characterization. Industrial processes for cleaning, gasifying and liquefying coal to produce cleaner fuels. Prerequisite: CME 302 (or CME 304); Corequisite: CME 308 (or CME 403).

CME 522 Polymer Science Lec. 3./Credit 3.

Synthesis, properties and fabrication of polymeric materials of industrial importance. Prerequisite: CME 302 (or CME 303).

CME 523 Industrial Pollution Control Lec. 3./Credit 3.

Study of water, air and thermal pollution control methods. Application to solution of pollution problems in chemical industry. Corequisite: CME 302 (or CME 304).

CME 524 Safety and Loss Prevention Lec. 3./Credit 3.

To increase awareness, interest, motivation, and knowledge in safety and loss prevention. Topics covered include case histories, management for safety, designing for safety, hazard identification, hazard assessment, hazard warning structure, reliability engineering, pressure systems, emission and dispersion, toxicity and toxic release, fire models and fire protection, fault propagation, safety in plant operation, personal safety. Corequisite: CME 407.