CHEMICAL ENGINEERING (CME)

Chemical Engineering (CME) Courses

CME 1201. Introduction to Chemical Engineering. (1-0) 1 Credit Hour. A broad survey of the practice of chemical engineering, intended to expose students to specialized areas of chemical engineering and potential career paths (e.g., bioengineering, environmental engineering, materials engineering, and petroleum/energy engineering) through discussions and guest lectures. Students will review ethics and safety, and practice technical communication through oral presentations and written assignments. Course Fees: LRE1 $20; STSE $10.

CME 2103. Chemical Process Principles. (3-0) 3 Credit Hours. Prerequisites: A grade of "C-" or better in CHE 1113, CME 1201, and MAT 1214. Students will learn basic principles of chemical engineering, including material and energy balances. Course Fees: LRE1 $20; STSE $30.

CME 2113. Physiology for Chemical Engineering. (3-1) 3 Credit Hours. Prerequisites: A grade of "C-" of better in BIO 1404 and MAT 1214. Fundamental principles of general and organs physiology, including composition and concentration of cellular and other body fluids, types of transport (e.g., diffusion, membrane transporters), energy (thermodynamics, metabolism), enzymes, feedback control, and membrane potentials with engineering applications and mathematical modeling. This course includes a 3 hour lecture and a 1 hour recitation per week. (Same as BME 2103. Credit cannot be earned for both CME 2113 and BME 2103.) Course Fees: LRE1 $20; STSE $30.

CME 2203. Computational Methods in Chemical Engineering. (3-1) 3 Credit Hours. Prerequisite: Completion of or concurrent enrollment in EGR 3323. Introduction to numerical techniques and computational tools essential for chemical engineering, including the use of data acquisition and processing, numerical analysis of linear, non-linear, and differential equations. Students will learn to use computer software to aid in their analysis (e.g., Matlab). This course includes a 3 hour lecture and a 1 hour recitation per week. Course Fees: LRE1 $20; STSE $30.

CME 2301. Chemical Process Safety and Risk Management. (1-0) 1 Credit Hour. Application of chemical process safety, risk assessment and management, including hazardous waste disposal and remediation. (Same as CME 4001. Credit cannot be earned for both CME 2301 and CME 4001.) Course Fees: LRE1 $20; STSE $10.

CME 2803. Biomechanics I. (3-1) 3 Credit Hours. Prerequisites: A grade of "C-" of better in EGR 2323 and PHY 1963. Introduction to fundamental engineering mechanics with focus on the human body. (Same as BME 2203. Credit cannot be earned for both CME 2803 and BME 2203.) Course Fees: LRE1 $20; STSE $30.

CME 3003. Introduction to Materials Science and Engineering. (3-0) 3 Credit Hours. Prerequisite: A grade of "C-" or better in CME 1201. Foundation for understanding the structure and properties of engineering materials such as ceramics, glass, polymers, composites, biomaterials, metals and alloys. An integrated introduction of materials' microstructure, thermodynamic properties, and corresponding mechanical, electrical, optical, and magnetic properties. (Credit cannot be earned for both CME 3003 and BME 3003.) Differential Tuition: $165.

CME 3103. Thermodynamics. (3-1) 3 Credit Hours. Prerequisites: A grade of "C-" or better in CME 2103 and completion of or concurrent enrollment in CHE 3804. Heat, work, equations of state, thermodynamic systems, control volume, first and second laws of thermodynamics, applications of the laws of thermodynamics, reversible and irreversible processes, introduction to basic thermodynamic cycles, vapor-liquid equilibria, and non-ideal solutions. One hour of problem solving recitation per week. (Credit cannot be earned for both CME 3103 and ME 3293.) Differential Tuition: $165.

CME 3113. Cellular Biology for Chemical Engineering. (3-0) 3 Credit Hours. Prerequisite: A grade of "C-" or better in CME 2103. Introduction to cell structure and function, energy conversions, protein sorting, signaling, cytoskeleton, cell adhesion, cell cycle, and mammalian genetics. This class consists of a 3-hour lecture. (Same as BME 3114. Credit cannot be earned for both CME 3113 and CME 3114.) Differential Tuition: $165.

CME 3303. Transport Phenomena I. (3-0) 3 Credit Hours. Prerequisite: A grade of "C-" or better in CME 3303. This course covers the fundamental of momentum transport, fluid mechanics and fluid unit operations. Topics discussed include fluid statics, fluid properties and fluid flow, overall mass, energy and momentum balances, incompressible and compressible flow in pipes, flow in packed and fluidized beds, pumps, compressors, agitators and nozzles, differential equations of fluid flow, non-Newtonian fluids, potential and creeping flow and boundary layer and turbulent flow. Differential Tuition: $165.

CME 3403. Separation Processes. (3-0) 3 Credit Hours. Prerequisite: A grade of "C-" or better in CME 3303. This course covers unit operations associated with mass transfer. Topics covered include absorption and stripping, mummification processes, filtration and membrane separations, distillation, liquid-liquid extraction, adsorption and ion exchange, settling, evaporation and drying. Differential Tuition: $165.

CME 3413. Biocompatibility of Materials: Tissue-Biomaterial Interaction. (3-0) 3 Credit Hours. Prerequisites: A grade of "C-" or better in CME 3003 and CME 3113. This course is an introduction to the interactions of cells and tissues with biomaterials. Blood composition and blood-material interactions, responses of the inflammatory and immune systems to biomaterials, the process of wound healing, protein structure and interactions with material surfaces, and the mechanisms of cell interactions with extracellular matrix components as well as cell/tissue responses to implant materials are reviewed in detail. Case studies of cardiovascular and orthopedic implants are discussed to illustrate that judicious selection of materials is a key aspect of implant design and a crucial choice for the success of various biomedical applications (e.g., in tissue engineering and biotechnology) which require regeneration of tissues. (Same as BME 3413. Credit cannot be earned for both CME 3413 and BME 3413.) Differential Tuition: $165.

CME 3433. Crystal Chemistry of Structure and Properties. (3-0) 3 Credit Hours. Prerequisite: A grade of "C-" or better in CME 3003. Principles of crystal chemistry applied to the relationships of crystallographic structures, compositions, and engineering properties of materials. Differential Tuition: $165.
## CME 3503. Kinetics and Reactor Design. (3-0) 3 Credit Hours.
Prerequisites: A grade of "C-" or better in CHE 3804 and CME 3303.
Fundamental principles to the design and analysis of batch, continuously stirred tank, and fixed bed chemical reactors; steady and unsteady state operations; effects of pressure and temperature; heterogeneous catalysis; analysis of transport processes in catalysis; special topics may include enzyme catalysis; fluid bed reactors; membrane reactors; and microscale reactors. Differential Tuition: $165.

## CME 3513. Nanomaterials and Nanobiotechnology. (3-0) 3 Credit Hours.
Prerequisite: A grade of "C-" or better in CME 3003. This course will introduce an overview of nanomaterials and nanotechnology development. Topics may include biocompatible nanomaterials, microfabrication, microfluidics, lab-on-a-chip, and applications in biomedical engineering. (Same as BME 3503. Credit cannot be earned for both CME 3513 and BME 3503.) Differential Tuition: $165.

## CME 3601. Chemical Engineering Laboratory I. (0-4) 1 Credit Hour.
Prerequisite: Completion of or concurrent enrollment in CME 3503. Basic principles and statistical design of experiments using software tools; experiments demonstrating key unit operations with emphasis on fluid flow and heat transfer. Written reports and oral presentations required. Differential Tuition: $55.

## CME 3703. Transport Phenomena II. (3-0) 3 Credit Hours.
Prerequisite: CME 3303 or instructor approval. This course focuses on the fundamentals and applications associated with heat and mass transfer. Topics discussed steady state conduction, principles of unsteady state heat transfer, convection, heat transfer coefficients, heat exchangers, radiation, steady state mass transfer, diffusions, convection, mass transfer coefficients, and unsteady state mass transfer. Differential Tuition: $165.

## CME 3803. Biomechanics II. (3-0) 3 Credit Hours.
Prerequisite: A grade of "C-" or better in CME 2803. Continuation of fundamental biomechanics to include elasticity, viscoelasticity, deformation, stress analysis, blood flow in the systemic and pulmonary circulation, and fluid-structure interaction. (Same as BME 3203. Credit cannot be earned for both CME 3803 and BME 3203.) Differential Tuition: $165.

## CME 3903. Bioinstrumentation. (3-1) 3 Credit Hours.
Prerequisite: A grade of "C-" or better in CME 2803. Topics include: principles of transducer operation, amplifiers and signal processing, recording and display. This course includes a 3 hour lecture and a 1 hour recitation per week. (Same as BME 3303. Credit cannot be earned for both CME 3903 and BME 3303.) Differential Tuition: $165.

## CME 4103. Process Dynamics and Control. (3-1) 3 Credit Hours.
Prerequisite: A grade of "C-" or better in CME 3403. Modeling of dynamic processes; response of controlled systems; transfer functions; response and stability of controlled systems; frequency response; design of feedback controllers; cascade, feed forward and multivariable control systems; process Instrumentation; use of simulators to design feedback controllers. One hour of problem solving recitation per week. Differential Tuition: $165.

## CME 4163. Chemical Engineering Design Fundamentals. (3-2) 3 Credit Hours.
Prerequisites: A grade of "C-" or better in CME 3103 and CME 3403. Application of design and economic principles to chemical engineering systems; analysis of costs of equipment, feedstocks, utilities, and risk assessment; optimization of equipment design using simulation tools. Students will be assembled in teams to perform materials and energy balances on their capstone design projects. (Formerly titled Thermodynamics II.) Differential Tuition: $165.

## CME 4201. Chemical Engineering Laboratory II. (0-4) 1 Credit Hour.
Prerequisite: Completion of or concurrent enrollment in CME 4103. Experiments demonstrating key unit operations with emphasis on mass transfer with and without reactions; hands on experience with process control. Written and oral reports required. Differential Tuition: $55.

## CME 4264. Plant Design. (2-6) 4 Credit Hours.
Prerequisite: A grade of "C-" or better in CME 4163. Strategic application of technical and economic constraints in the design of a chemical processing plant including most aspects of typical industrial design; integration of process safety and environmental impact factors. Students will work in small groups and submit a plant design project report that has a comprehensive design of all equipment included in the plant. Students will present the results of their design in a College of Engineering wide symposium. (Formerly titled Product and Process Design.) Differential Tuition: $220.

## CME 4423. Rheology. (3-0) 3 Credit Hours.
Prerequisites: To be determined by the instructor. This course covers the fundamentals of rheology as they apply to the oil and gas industry. Topics included cover crude oil flow rheology, drilling fluids, fluids in completion, crude oil pipelining, and fractal characterization of wax. Differential Tuition: $165.

## CME 4433. Process Optimization. (3-0) 3 Credit Hours.
Modern optimization theory, algorithms, and applications for large scale chemical engineering real-world problems. Topics included in the course and prerequisites required for the course will be determined by the instructor who teaches the course. Differential tuition: $165.

## CME 4513. Selected Topics in Bioengineering. (3-0) 3 Credit Hours.
Prerequisites vary with the topic (refer to the course syllabus on Bluebook or contact the instructor). An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. May be repeated for credit when topics vary, but not more than 6 semester credit hours, regardless of specialization, will apply to a bachelor's degree. Differential Tuition: $165.

## CME 4523. Selected Topics in Petroleum/Energy Engineering. (3-0) 3 Credit Hours.
Prerequisites vary with the topic (refer to the course syllabus on Bluebook or contact the instructor). An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. May be repeated for credit when topics vary, but not more than 6 semester credit hours, regardless of specialization, will apply to a bachelor's degree. Differential Tuition: $165.

## CME 4533. Selected Topics in Materials Science and Engineering. (3-0) 3 Credit Hours.
Prerequisites vary with the topic (refer to the course syllabus on Bluebook or contact the instructor). An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. May be repeated for credit when topics vary, but not more than 6 semester credit hours, regardless of specialization, will apply to a bachelor's degree. Differential Tuition: $165.

## CME 4543. Selected Topics in Environmental Engineering. (3-0) 3 Credit Hours.
Prerequisites vary with the topic (refer to the course syllabus on Bluebook or contact the instructor). An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. May be repeated for credit when topics vary, but not more than 6 semester credit hours, regardless of specialization, will apply to a bachelor's degree. Course Fees: LRE1 $20; STSE $30.
CME 4601. Independent Study. (0-0) 1 Credit Hour.
Prerequisites: Permission in writing (Independent Study Form available online) from the instructor and the Department Chair. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 3 semester credit hours of independent study, regardless of the concentration, will apply to a bachelor’s degree in Chemical Engineering. This course cannot be taken if 3 semester credit hours in CME 4701-3 have already been earned. Differential Tuition: $55.

CME 4602. Independent Study. (0-0) 2 Credit Hours.
Prerequisites: Permission in writing (Independent Study Form available online) from the instructor and the Department Chair. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 3 semester credit hours of independent study, regardless of the concentration, will apply to a bachelor’s degree in Chemical Engineering. This course cannot be taken if 3 semester credit hours in CME 4701-3 have already been earned. Differential Tuition: $110.

CME 4603. Independent Study. (0-0) 3 Credit Hours.
Prerequisites: Permission in writing (Independent Study Form available online) from the instructor and the Department Chair. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 3 semester credit hours of independent study, regardless of the concentration, will apply to a bachelor’s degree in Chemical Engineering. This course cannot be taken if 3 semester credit hours in CME 4701-3 have already been earned. Differential Tuition: $165.

CME 4701. Chemical Engineering Research. (0-0) 1 Credit Hour.
Prerequisite: Permission in writing (form online) from the instructor, the student’s advisor, and the Department Chair. Advanced laboratory practice and introduction to chemical engineering research. This course may be used to satisfy one of the electives for the CME tracks. May be repeated for credit but no more than 3 semester credit hours will apply towards the bachelor’s degree in Chemical Engineering. This course cannot be taken if 3 semester credit hours in CME 4601-3 Independent study have already been earned. Differential Tuition: $55.

CME 4702. Chemical Engineering Research. (0-0) 2 Credit Hours.
Prerequisite: Permission in writing (form online) from the instructor, the student’s advisor, and the Department Chair. Advanced laboratory practice and introduction to chemical engineering research. This course may be used to satisfy one of the electives for the CME tracks. May be repeated for credit but no more than 3 semester credit hours will apply towards the bachelor’s degree in Chemical Engineering. This course cannot be taken if 3 semester credit hours in CME 4601-3 Independent study have already been earned. Differential Tuition: $110.

CME 4703. Chemical Engineering Research. (0-0) 3 Credit Hours.
Prerequisite: Permission in writing (form online) from the instructor, the student’s advisor, and the Department Chair. Advanced laboratory practice and introduction to chemical engineering research. This course may be used to satisfy one of the electives for the CME tracks. May be repeated for credit but no more than 3 semester credit hours will apply towards the bachelor’s degree in Chemical Engineering. This course cannot be taken if 3 semester credit hours in CME 4601-3 Independent study have already been earned. Differential Tuition: $165.

CME 4803. Chemical Engineering Internship. (0-0) 3 Credit Hours.
Prerequisite: Permission in writing (form online) from the instructor, the student’s advisor, and the Department Chair. Internship with a chemical engineering industry. No more than 3 semester credit hours will apply to the bachelor’s degree in Chemical Engineering. Differential Tuition: $165.