

# Chemical Engineering (CME)

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## Chemical Engineering (CME) Courses

### **CME 1201. Introduction to Chemical Engineering. (1-0) 1 Credit Hour.**

Prerequisites: A grade of "C-" or better in CHE 1103 and MAT 1214. A broad introduction to chemical engineering research and practice, intended to expose students to wide range of opportunities through research seminars and guest lectures. Topics covered include role and impact of materials in technology and societies. How materials are extracted from the earth, processed, and shaped into products, including discussion of disposal and re-use of materials, are explored.

### **CME 2203. Computational Methods in Chemical Engineering. (3-1) 3 Credit Hours.**

Prerequisite: Completion of or concurrent enrollment in EGR 2323. Introduction to numerical techniques and computational tools essential for chemical engineering including the use of data acquisition and processing, engineering drawing, numerical modeling of linear and differential equations, and presentation tools. Students will learn to use Matlab, Mathematica, LabView, and SolidWorks as part of this course. One hour of problem solving recitation per week.

### **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 process, and corresponding mechanical, electrical, optical, and magnetic properties. (Same as BME 3003. Credit cannot be earned for both CME 3103 and BME 3003).

### **CME 3103. Thermodynamics I. (3-1) 3 Credit Hours.**

Prerequisite: A grade of "C-" or better in CME 2203. Heat, work, equations of state, thermodynamics systems, control volume, first and second laws of thermodynamics, applications of the laws of thermodynamics, reversible and irreversible processes, and introduction to basic thermodynamic cycles. One hour of problem solving recitation per week. (Same as ME 3293. Credit cannot be earned for both CME 3103 and ME 3293).

### **CME 3203. Thermodynamics II. (3-0) 3 Credit Hours.**

Prerequisite: A grade of "C-" or better in CME 3103. Advanced treatment of chemical and phase equilibria in multicomponent systems including a detailed study of non-ideal solutions. Volumetric properties of fluids. Introduction to statistical thermodynamics.

### **CME 3303. Transport Phenomena. (3-0) 3 Credit Hours.**

Prerequisite: A grade of "C-" or better in CME 2203. Fundamental principles of momentum, energy and mass transport in various processes with exploration of laminar and turbulent flow, heat exchange, and mass diffusion.

### **CME 3403. Transport Processes. (3-1) 3 Credit Hours.**

Prerequisite: A grade of "C-" or better in CME 3303. Design and analysis of heat exchanger and furnaces, fluid metering, mixing, sedimentation, filtration, mass transfer operations; types of equipment used and practical chemical engineering applications. One hour of problem solving recitation per week.

### **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.

### **CME 3503. Kinetics and Reactor Design. (3-1) 3 Credit Hours.**

Prerequisites: A grade of "C-" or better in CHE 3804 and CME 3303. Fundamental principles to the design and analysis of chemical reactors; steady and unsteady state operations; effects of pressure and temperature; heterogeneous catalysis; analysis of transport processes in catalysis; special topics including enzyme catalysis; membrane reactors; microscale reactors. One hour of problem solving recitation per week.

### **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 and oral reports required.

### **CME 4001. Chemical Process Safety and Risk Management. (1-0) 1 Credit Hour.**

Prerequisite: A grade of "C-" or better in CME 2203. Application of chemical process safety, risk assessment and management, including hazardous waste disposal and remediation.

### **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 uncontrolled 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.

### **CME 4163. Chemical Engineering Design Fundamentals. (3-2) 3 Credit Hours.**

Prerequisite: A grade of "C-" or better in 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.

### **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; process control. Special cases in biochemical and environmental engineering; Written and oral reports required.

### **CME 4264. Product and Process 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 social and sustainability issues including hazardous waste disposal and remediation. Students work in small groups and submit a plant design project report.

### **CME 4413. Biochemical Engineering. (3-0) 3 Credit Hours.**

Prerequisites: A grade of "C-" or better in BIO 1404 and BME 2103. Kinetics of single substrate enzyme kinetics; recombinant DNA technology in microbial and mammalian culture systems; fermentation reactor design and control; protein purification; Introduction to bioinformatics.

**CME 4423. Rheology. (3-0) 3 Credit Hours.**

Prerequisites: A grade of "C-" or better in EGR 3323 and CME 3403.  
Advanced topics covering non-Newtonian fluids, multiphase transport and flow through porous media with focus on applications to chemical processing industries.

**CME 4511. Biochemical Engineering Laboratory. (0-4) 1 Credit Hour.**

Prerequisite: Completion of or concurrent enrollment in CME 4413.  
Microbial cell culture; cloning, expression and purification of a recombinant protein; operation of fermenter, monitoring, and purification of protein; emphasis on scale-up.

**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 concentration, will apply to a bachelor's degree.

**CME 4523. Selected Topics in Petroleum and Energy Systems. (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 concentration, will apply to a bachelor's degree.

**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 concentration, will apply to a bachelor's degree.

**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 concentration, will apply to a bachelor's degree.

**CME 4553. Selected Topics in Business and Technology Management. (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 concentration, will apply to a bachelor's degree.

**CME 4601. Independent Study. (0-0) 1 Credit Hour.**

Prerequisites: Permission in writing (Independent Study Form available online) from the instructor, the student's advisor, and the Department. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of the concentration, will apply to a bachelor's degree.

**CME 4602. Independent Study. (0-0) 2 Credit Hours.**

Prerequisites: Permission in writing (Independent Study Form available online) from the instructor, the student's advisor, and the Department. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of the concentration, will apply to a bachelor's degree.

**CME 4603. Independent Study. (0-0) 3 Credit Hours.**

Prerequisites: Permission in writing (Independent Study Form available online) from the instructor, the student's advisor, and the Department. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of the concentration, will apply to a bachelor's degree.