CME

Chemical and Molecular Engineering

CME 101 Introduction to Chemical and Molecular Engineering
Integrates students into the community of the College of Engineering and Applied Sciences and the major in Chemical and Molecular Engineering with a focus on personal and institutional expectations. Emphasizes the interdisciplinary role of the chemical engineering profession in the 21st century. Includes consideration of professional teamwork and the balance of professional growth with issues of societal impact.
3 credits

CME 199 Introduction to Undergraduate Research
An introduction to independent research and basic research skills. Students perform an independent research project in chemical and molecular engineering under the supervision of a faculty member. May be repeated for a maximum of 3 credits.
0-3 credits

CME 300 Writing in Chemical and Molecular Engineering
See “Requirements for the Major in Chemical and Molecular Engineering. Upper-Division Writing Requirement.”
Prerequisites: CME major; U3 or U4 standing; WRT 102
Corequisite: CME 310
SU grading

CME 304 Chemical Engineering Thermodynamics I
First and second laws of thermodynamics, PVT behavior of pure substances, states of state for gases and liquids, phase equilibria, mass and energy balances for closed and open systems, reversibility and equilibrium, application of thermodynamics to flow processes, heat effects during chemical reactions and combustion.
Prerequisites: PHY 132; CHE 132; CSE 130 or ESG 111 or MEC 112 or ESE 124
3 credits

CME 310 Chemical Engineering Laboratory I: Unit Operation and Fundamentals
Introduces general safety in a chemical engineering laboratory handling high pressure equipment, Selection and identification of unit components, Batch and continuous units. Reactor types: stirred, bubble column, and slurry-phase reactors. Precise measurements of pressure and temperature variables. Mass balance in a chemical reaction. Simulated distillation.
Prerequisites: CME 304
Corequisite: CME 300
2 credits

CME 314 Chemical Engineering Thermodynamics II
Equilibrium and the Phase Rule; VLE model and K-value correlations; chemical potential and phase equilibria for ideal and non-ideal solutions; heat effects and property changes on mixing; application of equilibrium to chemical reactions; Gibbs-Duhem and chemical potential for reacting systems; liquid/liquid, liquid/solid, solid/vapor, and liquid/vapor equilibria; adsorption and osmotic equilibria, steady state flow and irreversible processes. Steam power plants, internal combustion and jet engines, refrigeration cycle and vapor compression, liquefaction processes.
Prerequisites: CME 304
3 credits

CME 318 Chemical Engineering Fluid Mechanics
Introduces fluid mechanics. Dynamics of fluids in motion; laminar and turbulent flow, Bernoulli’s equation, friction in conduits; flow through fixed and fluid beds. Study of pump and compressor performance and fluid metering devices. Includes introduction to microfluidics.
Prerequisites: AMS 261 (or MAT 203 or 205); PHY 131 (or 125 or 141)
3 credits

CME 320 Chemical Engineering Laboratory II: Chemical and Molecular Engineering
Introduction and operation of a continuous unit handling of air-sensitive/water-sensitive materials, sonolyis and thermal techniques for materials synthesis, preparation of polymer nano-composites and nano-sized materials.
Prerequisites: CME 310
3 credits

CME 322 Chemical Engineering Heat and Mass Transfer
Heat transfer by conduction, principles of heat flow in fluids with and without phase change, heat transfer by radiation, heat-exchange equipment. Principles and theory of diffusion, mass transfer between phases, distillation, leaching and extraction, fixed-bed membrane separation, crystallization.
Prerequisites: CME 318
3 credits

CME 323 Reaction Engineering and Chemical Kinetics
Prerequisites: CME major; U3 standing; CME 312 and 314
3 credits

CME 327 Molecular Modeling for Chemical Engineers
Molecular modeling techniques and simulation of complex chemical processes. Use of Monte Carlo methods and Molecular Dynamics methods. Emphasis on the simulation and modeling of biopolymeric systems.
Prerequisites: PHY 132; ESG 111 or MEC 112; AMS 261 or MAT 203; AMS 361 or MAT 303
3 credits

CME 371 Biomedical Polymers
This course focuses on the clinical performance of polymers and discusses the chemical, physical, mechanical and biological questions raised by the unique use of these materials within the human body. The chemistry and properties of key biomedical polymers will be studied and their biomedical applications will be discussed. The biomaterials’ response to the various components of its biological environment will be addressed, followed by the response of the host to the presence of the implanted polymer. Special attention will be given to the interaction of the system with two fundamental phenomena: the Foreign Body Response and the Coagulation Cascade. Applications of bio-polymers to tissue engineering and the relevance of nanoscale phenomena are discussed.
Prerequisites: CME 321 or permission of instructor
3 credits

CME 401 Separation Technologies I
Fundamentals of separations. Introduction to standard classical and advanced separation methods and their relative merits and limitations. Distillation, cryos-tallization, filtration, centrifugation, absorption, and stripping methods. Includes fundamentals of chromatography.
Prerequisites: CME major; U3 or U4 standing; CME 323
3 credits

CME 402 Separation Technologies II
Introduces separation technologies in a plant design. Principles of supercritical fluids extraction and membrane separation. Packaged tower design for separations. Batch versus continuous operation.
Prerequisites: CME 401
3 credits

CME 410 Chemical Engineering Laboratory III: Instrumentation, Material Design, and Characterization
Prerequisites: CME 320
3 credits

CME 420 Chemical Engineering Laboratory IV: Directed Research
Directed laboratory research or internship in industry. Includes original research project selection and a formal report preparation.
Prerequisites: CME 410
2 credits

CME 440 Process Engineering Design I
Classical methods of chemical process engineering, advanced mathematical techniques, and computer software for efficient and accurate process design and development. Mini-project design.
Prerequisites: CME major; U3 or U4 standing; CME 320 and 327
3 credits

CME 441 Process Engineering Design II
Major design project; a review of engineering design principles; engineering economics, economic evaluation, capital cost estimation; process optimization; profitability analysis for efficient and accurate process design.
Prerequisites: CME 401 and 440
3 credits