CME 312 Material and Energy Balance
Introduces analysis of chemical processes using the laws of conservation and energy as they apply to non-reacting and reacting systems. Solution of the con- cepts of equilibrium in physico-chemical systems, and utilization of basic principles of thermodynamics. Numerical methods used in the design an optimization of chemical engineering processes. Solution of complex chemical engineering problems.
Prerequisites: ESG 111 or MEC 112; CHE 132 and 134; AMS 261 or MAT 203; CME 304, B- or better in CME 304
3 credits

CME 314 Chemical Engineering Thermodynamics II
Equilibrium and the Phase Rule; VLE model and K-value correlations; chemical potential and phase equilib- ria for ideal and non-ideal solutions; heat effects and property changes on mixing; application of equilibria to chemical reactions; Gibbs-Duhem and chemical potential for reacting systems; liquid/liquid, liquid/solid, solid/vapor, and liquid/vapor equilibria; absorp- tion and osmotic equilibria, steady state flow and irre- verseable processes. Steam power plants, internal com- bination and jet engines, refrigeration cycle and vapor compression, liquefaction processes.
Prerequisite: CME 304, B- or better in CME 304
3 credits

CME 315 Numerical Methods & Statistical Analysis
Mathematical modeling lies at the heart of chemical engineering. Understanding, predicting, designing, optimizing, and controlling chemical processes and phenomena all require the development of good math- ematical models. This course provides students with the concepts, processes, and tools for an introduction to such chemical engineering calculations with a mathematical software package (MATLAB).
Pre- or Corequisite: AMS 361
3 credits

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

CME 320 Chemical Engineering Lab II: Chemical and Molecular Engineering
Prerequisite: CME 310
2 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, dis- tillation, leaching and extraction, fixed-bed membrane separation, crystallization.
Prerequisite: CME 318, CME 304, B- or better in CME 304
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 com- plex 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 203; CME 304, B- or better in CME 304
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 poly- mers will be studied and their biomedical applications will be discussed. The biomaterial’s 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 atten- tion will be given to the interaction of the system with two fundamental phenomena: the Foreign Body Response and the Coagulation Cascade. Applications of bio-polymer to tissue engineering and the rele- vance of nanoscale phenomena are discussed.
Pre- or Corequisite: CME 321 or permission by the 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, crystallization, 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
Prerequisite: CME 401
3 credits

CME 410 Chemical Engineering Laboratory III: Instrumentation, Material Design and Characterization
Prerequisite: CME 320
2 credits

CME major; U3 or U4 standing; CME 323
CME 420 Chemical Engineering Laboratory IV: Directed Research
Directed laboratory research. At the end of the junior year, in consultation with an advisor, the CME student will write a 1/2 page abstract describing proposed research. This abstract must be approved by the Undergraduate Program Committee (UPC). Through work accomplished in CME 420, the student will expand the research proposal into a senior thesis written in the format of a paper in a scientific journal. The student will defend his/her thesis in front of the UPC prior to the end of the senior year. After the defense, three copies of the finished thesis must be presented to the student's advisor at least 21 days before the date of graduation. The advisor then submits the thesis for final approval to the other UPC members.
Prerequisite: CME 410
2 credits

CME 440 Process Engineering and 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, CME 327
3 credits

CME 441 Process Engineering and 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

CME 470 Polymer Synthesis: Theory and Practice, Fundamentals, Methods, Experiments
This course teaches general methods and processes for the synthesis, modification, and characterization of macromolecules. This includes general techniques for purification, preparation and storage of monomers; general synthetic methods such as bulk, solution, and heterogeneous polymerization; addition and condensation polymerization; methods of separation and analysis of polymers.
Prerequisites: PHY 132, PHY 134, CHE 322
3 credits

CME 488 Industrial Internship in Chemical Engineering
Research project in an industrial setting under joint supervision of an industrial mentor and chemical engineering faculty. Project to cover some or all of the following chemical engineering principles of product synthesis: experiment design, data collection, data analysis, process simulations, and report writing related to an actual production facility. May be repeated but a maximum of 3 credits of research electives can be counted towards technical elective requirements.
Prerequisites: B average in CME courses; permission of supervising faculty member
0-3 credits

CME 499 Research in Chemical Engineering
Independent research project under the supervision of a chemical engineering or interdisciplinary faculty member. Project to cover some or all of the following chemical engineering principles: experiment design, data collection, date analysis, process simulations, and report writing. May be repeated but a maximum of 3 credits of research electives can be counted towards technical elective requirements.
Prerequisites: B average in CME courses; permission of supervising faculty member
0-3 credits