CHE—CHEMICAL ENGINEERING

COLLEGE OF ENGINEERING

CHE U300 Introduction to Engineering Co-op Education 1 SH
Provides students preparation for the first co-op experience. Focuses on skills that provide a basis for successful co-op engagement including expectations and requirements, an introduction to professional credentials, résumé construction, self-assessment and goal setting, interviewing, professional and co-op ethics, issues of diversity in the workplace community, academic planning and decision making, and an introduction to career portfolios. Prereq. GE U100.

CHE U308 Chemical Engineering Calculations 4 SH
Examines the applications of fundamental laws of mass and energy conservation to chemical and physical processes. Emphasizes material and energy balances on chemical processes. Students are given an opportunity to develop skills in applying chemistry, physics, and mathematics to identify and solve chemical engineering problems. Coreq. CHE U309. Prereq. CHM U151.

CHE U309 Lab for CHE U308 1 SH
Accompanies CHE U308. Offers laboratory session to practice problem formation and solution of chemical engineering problems using modern computer techniques. Problems and concepts follow CHE U308. Coreq. CHE U309.

CHE U310 Transport Processes and Operations 1 4 SH
Covers the fundamental principles of transport balances, with an emphasis on momentum transport of incompressible and compressible fluids. Considers macroscopic (integral) and differential balances; flux laws for molecular and convective transport; and empirical correlations and dimensional analysis for analysis/design of engineering transport problems in the chemical, pharmaceutical, food, and materials industries. Prereq. MTH U343 and CHE U308.

CHE U312 Transport Processes and Operations 2 4 SH
Continues CHE U310. Presents the fundamentals and applications of energy transport, mass transport, and simultaneous energy/mass transport. Macroscopic and differential balances equations are combined with appropriate flux laws and correlations to analyze and design various types of energy and/or mass transport equipment. Prereq. CHE U310.

CHE U320 Chemical Engineering Thermodynamics 1 4 SH
Covers the first law and its application to batch and flow systems, heat effects in chemicals, and physical properties and real fluids. Applies basic principles and mathematical relations to the analysis and solution of engineering problems. Prereq. CHE U308, CHM U401, and MTH U341.

CHE U322 Chemical Engineering Thermodynamics 2 4 SH
Continues CHE U320. Covers thermodynamic properties of mixtures; fugacity and the fugacity coefficients from equations of state for gaseous mixtures; liquid phase fugacities and activity coefficients for liquid mixtures; phase equilibriums; the equilibrium constant for homogeneous gas-phase reactions; and extension of theory to handle simultaneous, heterogeneous, and solution reactions. Prereq. CHE U320.

CHE U500 Professional Issues in Engineering 1 SH
Provides students with an opportunity to reflect on both academic and co-op experiences in the context of planning for the senior year and beyond. Issues include professional and ethical issues, resolving ethical conflicts, awareness of engineers as professionals in a diverse world, strengthening decision-making skills, career portfolios, and lifelong learning needs, goals, and strategies. Students reflect upon issues of diversity from their experience in the University and in their cooperative education placements. Explores the role of different work and learning styles and diverse personal characteristics on the workplace and the classroom. Professional issues include impact of the cultural context, both in the United States and around the world, on the client, government relations, and workplace. Prereq. Junior or senior standing.

CHE U510 Chemical Engineering Kinetics 4 SH
Covers fundamental theories of the rate of chemical change in homogeneous reacting systems, integral and differential analysis of kinetic data; design of batch and continuous-flow chemical reactors; and an introduction to heterogeneous reactions and reactor design. Prereq. CHE U312 and CHE U322.

CHE U512 Chemical Engineering Process Control 4 SH
Covers Laplace transform and its use in solving ordinary differential equations; modeling liquid-level, temperature, and composition dynamics; linearization of nonlinear systems; first- and second-order system transfer functions; control valve sizing, and PID control; computer simulation of open- and closed-loop systems; control system stability; and feed-forward and cascade control. Prereq. Senior standing.

CHE U520 Unit Operations and Separation Processes 3 SH
Involves experiments in unit operations including process measurements, fluid metering, heat exchangers, and separation processes. Separation processes describe the principles utilized in the separation of chemical mixtures. Introduces equilibrium stages as applied to the separation of binary mixtures by liquid-liquid extraction and by continuous distillation. Coreq. CHE U521. Prereq. CHE U312 and CHE U322.

CHE U521 Lab for CHE U520 2 SH
Accompanies CHE U520. Covers topics from the course through various experiments. Coreq. CHE U520.
CHE U608 Nanotechnology in Engineering 4 SH
Explores a wide range of new technologies based on, or influenced by, breakthroughs in nanoscience. Includes such nanotechnologies (the refinement of functional properties of materials, devices, or systems that are in at least one dimension smaller than 100 nm) as spintronics, quantum computing, carbon nanotube electronics, nanoparticle cancer remediation strategies, biomolecular electronics, and nanomachines. A general goal is the engineering of new or enhanced macroscopic properties from nanostructure or nanoscale materials and components. Offers review of the scientific literature, classroom lecture, seminars by international leaders of nanotechnology, and student team projects to enable the student to become well versed in this important burgeoning field. Same as ECE U608. Prereq. Senior standing in engineering, biology, chemistry, or physics, or permission of instructor.

CHE U624 Chemical Process Safety 4 SH
Introduces students to important technical fundamentals as applied to chemical process safety. Demonstrates good chemical process safety practice through chemical plant trips, visiting experts, and video presentations. Prereq. Senior standing.

CHE U630 Biochemical Engineering Fundamentals 4 SH
Presents key biological concepts and applies chemical engineering principles (material balances, kinetics, and transport phenomena) to biological systems. Introductory topics include cell biology, enzymes kinetics, replication, transcription, translation, metabolic pathways, and genetic engineering. The majority of the course is devoted to kinetics of growth and product formation from cell cultures; biological reactor kinetics, design, and scale-up; transport phenomena in biological systems; and downstream processing of biological products. Prereq. Senior standing.

CHE U634 Nanomaterials: Thin Films and Structures 4 SH
Explores the applications and processing of electronic materials in nano-scale films and nanostructures. Stresses nanotechnology as an important field of chemical engineering that has applications in a variety of fields, such as material processing, drug delivery, semiconductor devices, and catalysis. Emphasizes the basic properties of electronic materials and the fundamental kinetic and transport principles in the manufacturing of thin films and nanostructures. Discusses the fundamentals in terms of the latest research in multifunctional devices and nanotechnology. Prereq. Senior standing or permission of instructor.

CHE U699 Special Topics in Chemical Engineering 4 SH
Focuses on topics related to chemical engineering to be selected by instructor. Prereq. Permission of the department.

CHE U701 Chemical Process Design 1 4 SH
Focuses on the design of a chemical process. Topics include computer simulation of steady-state processing conditions, selecting process operations, preparing flow sheets and stream tables, and evaluating the economics of a chemical process design. Explores a comprehensive chemical process design problem with a team approach. Coreq. CHE U702. Prereq. CHE U510, CHE U520, and senior standing.

CHE U702 Lab for CHE U701 1 SH
Accompanies CHE U701. Covers topics from the course through computational lab. Coreq. CHE U701.

CHE U703 Chemical Process Design 2 3 SH
Continues CHE U701. Requires each student to solve a comprehensive chemical process design problem. Topics include heat and power integration in chemical processing, design and scheduling of batch processes, sequencing separation operations, and safety considerations in process design. Coreq. CHE U704. Prereq. CHE U701 and senior standing.

CHE U704 Lab for CHE U703 2 SH
Accompanies CHE U703. Covers topics from the course through computational lab. Coreq. CHE U703. Prereq. CHE U701 and senior standing.

CHE U721 Projects 1 4 SH
Continues CHE U721. Builds upon the previous course. Requires lab fee. Prereq. CHE U721, senior standing, and permission of the department.

CHE U722 Projects 2 4 SH
Offers individual research related to some phase of chemical engineering. Open only to students selected by the department head on the basis of scholarship and proven ability. Requires lab fee. Prereq. Senior standing and permission of the department.

CHE U921 Directed Study 1 SH
CHE U922 Directed Study 2 SH
CHE U923 Directed Study 3 SH
CHE U924 Directed Study 4 SH
Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. Prereq. Permission of instructor.

CHE U931 Independent Study 1 SH
CHE U932 Independent Study 2 SH
CHE U933 Independent Study 3 SH
CHE U934 Independent Study 4 SH
Offers theoretical or experimental work under individual faculty supervision. Prereq. Permission of instructor.
CHE U970 Junior/Senior Honors Project 1  4 SH
Focuses on in-depth project in which a student conducts research or produces a product related to the student’s major field. Culminating experience in the University Honors Program. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. Prereq. Honors program participation.

CHE U971 Junior/Senior Honors Project 2  4 SH
Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student’s major field. Culminating experience in the University Honors Program. Prereq. CHE U970 and honors program participation.