CHEMICAL ENGINEERING

Department of Chemical Engineering and Materials Science
College of Engineering

101 Molecular Frontiers in Chemical Engineering
Fall. 1(2-0) RB: High school chemistry, biology, algebra, physics.

201 Material and Energy Balances
Fall, Spring. 3(3-0) P: (MTH 133 or LB 119) and (CE/CHE 142 or CHEM 143 or CHEM 152 or LB 172) and (CSE 131 or concurrently) or (CSE 231 or concurrently) or (EGR 102 or concurrently)

321 Thermodynamics for Chemical Engineering
Spring. 3(5-0) P: CHE 201

422 Transport Phenomena
Spring. 3(3-0) P: CHE 311 and CHE 312
Mathematical and physical analogies among mass, energy and momentum transfer processes. Dimensional analysis and solutions to multivariable boundary value problems. Numerical solutions to nonlinear problems.

431 Chemical Reaction Engineering
Fall. 4(5-0) P: CHE 210 or concurrently and CHE 201 R: Open only to juniors or seniors in the Chemical Engineering major.

432 Process Analysis and Control
Spring. 3(3-0) P: CHE 431

433 Process Design and Optimization I
Fall. 4(5-0) P: CHE 311 and CHE 312 and (CHE 431 or concurrently) and completion of Tier I writing requirement R: Open to seniors in the College of Engineering.
Applications of chemical engineering principles in design calculations. Selection of optimum design. Influence of design on capital investment, operating cost, product loss and quality. Mathematical programming methods for optimization.

434 Process Design and Optimization II
Spring. 2(0-4) (CHE 433)

472 Composite Materials Processing
Fall. 3(2-3) P: CHE 311 or ME 332 or CE 321
Manufacturing processes for thermoset and thermoplastic matrix composites. Mechanical and thermal evaluation of composites. Rheology and molding of fiber-filled materials.

CHE—Chemical Engineering

473 Chemical Engineering Principles in Polymers and Materials Systems
Spring. 3(3-0) P: CHE 311 and CHE 321 and CHE 431 and CEM 352 SA: CHE 371
Application of chemical engineering principles to polymer and materials systems. Structures and properties of metals, ceramics and polymers. Thermodynamics, synthesis, rubber elasticity, viscoelasticity, kinetics, rheology, and processing of polymers systems. Application of statistics and problem-solving skills to materials systems.

481 Biochemical Engineering
Fall. 3(2-3) P: (CHE 431 and BMB 401) or (BMB 461 and BMB 462)
Applications of microbiology and biochemistry to biochemical engineering. Kinetics and thermodynamics of biochemical reactions. Transport phenomena in biological systems. Biorreactor design and scale-up.

490 Independent Study
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to juniors or seniors in the College of Engineering. Approval of department.
Theoretical or experimental studies of current research topics in chemical engineering. Individual interaction with faculty adviser.

491 Selected Topics in Chemical Engineering
Fall, Spring. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to juniors or seniors or graduate students in the Department of Chemical Engineering.
Study of newly developing or non-traditional chemical engineering topics in a classroom environment.

801 Advanced Chemical Engineering Calculations
Fall. 3(3-0)
Formulation of differential equations modeling physical phenomena in chemical engineering. Application of analytical and numerical solution methods. Interpretation of solutions.

802 Research Methods
Fall. 3(3-0) Interdepartmental with Materials Science and Engineering. Administered by Chemical Engineering.
Skills required for graduate research. Critically reviewing the literature, defining a fundamental research problem, effective oral and written presentations, ethics, and statistics.

804 Foundations in Chemical Engineering I
Spring. 3(3-0)

805 Foundations in Chemical Engineering II
Summer. 3(2-2)
821 Advanced Chemical Engineering
Thermodynamics
Fall. 3(3-0) R: Open only to Chemical Engineering majors.

822 Advanced Transport Phenomena
Spring. 3(3-0) RB: CHE 801

831 Advanced Chemical Reaction Engineering
Spring. 3(3-0)
Characterization of solid catalysts. Heterogeneous reaction rate expressions. Simultaneous mass and heat transport and chemical reaction in porous catalysts. Design of fixed-bed and fluidized-bed reactors. Industrial catalytic reactions.

871 Material Surfaces and Interfaces
Fall of odd years. 3(3-0) Interdepartmental with Materials Science and Engineering. Administered by Materials Science and Engineering, RB: CEM 392 or CEM 434 or MSE 351 R: Open only to graduate students in the Department of Chemical Engineering and Materials Science or Department of Chemistry or School of Packaging. SA: MSM 871 Physical and chemical nature of solid surfaces and their interaction with gases, liquids, and other solids. Characterization of surfaces and solid-solid interfaces. Relation of surface and interfacial structure to engineering phenomena.

872 Polymers and Composites:
Manufacturing, Structure and Performance
Spring of even years. 3(3-0) R: Open only to graduate students in the College of Engineering or the Department of Chemistry. Structure-Property Relations of Polymers, Fibers, Fabrics and Composites, Material Selection, Manufacturing Processes, Process Induced Microstructure, Prediction of Composite Mechanical Properties, Dimensional Stability, Design of Cure Cycles, Mold Design.

882 Advanced Biochemical Engineering
Spring of even years. 3(3-0)

883 Multidisciplinary Bioprocessing Laboratory
Spring. 3(1-4) RB: (CHE 481) or graduate work in engineering, biosciences or related disciplines. Mentored research project conducted in multidisciplinary team. Bioprocessing research methods. Teamwork skills.

890 Independent Study
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to Chemical Engineering majors. Approval of department. Supervised individual investigation of a problem in chemical engineering.

891 Selected Topics
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to Chemical Engineering majors. Physical and mathematical analysis of phenomena such as swirling flows or stability of reactions and transport processes.

892 Seminar
Fall, Spring. 1(0-2) A student may earn a maximum of 4 credits in all enrollments for this course. Interdepartmental with Materials Science and Engineering. Administered by Chemical Engineering. R: Open only to Chemical Engineering majors. Presentations of detailed studies of one or more specialized aspects of chemical engineering and materials science.

899 Master’s Thesis Research
Fall, Spring. 1 to 8 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Open only to Chemical Engineering majors. Master’s thesis research.

972 Viscoelasticity and Flow of Polymeric Materials
Spring of odd years. 3(3-0)
Time dependent and steady flow properties of polymeric materials related to molecular and structural parameters. Examples of polymeric blends and composites with thermoplastic and thermoset components.

999 Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 72 credits in all enrollments for this course. R: Open only to Chemical Engineering majors. Doctoral dissertation research.