CHE 331. Chemical Engineering Laboratory II. 2 Credits.  
Experiments illustrating physico-chemical principles and the application of fluid flow and heat transfer theory. Prerequisites: CHE 315, CHE 206, and C or better in CHE 201; Chemical Engineering majors only or permission of instructor. F.

CHE 332. Chemical Engineering Laboratory III. 2 Credits.  
Experiments reinforcing physico-chemical principles, unit operations, and separations. Pre-design labs are also introduced. Prerequisites: CHE 331; Chemical Engineering majors only or permission of instructor. S.

CHE 335. Chemical Engineering Summer Laboratory II. 3 Credits.  
Experiments reinforcing physico-chemical principles, unit operations, separations, and mass and energy balances. Pre-design labs are also introduced. Prerequisites: CHE 201, CHE 206, CHE 315 and either CHE 232 or CHE 235; Chemical Engineering majors only or permission of instructor. SS.

CHE 380. Service Learning. 1-3 Credits.  
Design and implementation of engineering-related projects to serve the community, including K-12 STEM outreach. Hands-on design experience by the student working as an individual or part of a team. Repeatable to 9 credits. S/U grading. F,S.

CHE 381. Experiential Learning. 1-3 Credits.  
Hands-on design experience by student teams. May include interdisciplinary work on engineering student design competitions. Repeatable to 9 credits. S/U grading. F,S.

CHE 397. Cooperative Education. 1-2 Credits.  
A practical work experience with an employer closely associated with the student's academic area. Arranged by mutual agreement among student, department and employer. Prerequisite: Sophomore standing in the chemical engineering degree program; Cumulative GPA of 2.0 or higher. Repeatable to 12 credits. S/U grading. F,S,SS.

CHE 403. Molecular Thermodynamics and Kinetics. 3 Credits.  
A theoretical and mathematical understanding of statistical thermodynamics, quantum mechanics and kinetic theory of gases. Focus on estimating macroscopic thermodynamic and transport properties, equilibrium constants, and kinetic rate constants from a microscopic description of matter. Prerequisites: CHE 303 and CHE 321; CEM majors only or permission of instructor. F.

CHE 404. Air Emissions: Regulation and Control. 3 Credits.  
This course is designed to enable engineers to understand natural and anthropogenic sources of air pollution, their impact on health and the environment, and learn ways to minimize air emissions by application of control practices. F.

CHE 408. Process Dynamics and Control. 3 Credits.  
Dynamics and control of chemical processes and of systems. Prerequisites: MATH 266, CHE 206, and CHE 305; Chemical Engineering majors only or permission of instructor. F.

CHE 411. Plant Design I: Process Design and Economics. 4 Credits.  
Introduction to how projects are executed in the process industries, including an understanding of what constitutes preliminary process design, preliminary cost estimation, the fundamentals of economics as applied to process economic assessment, sustainability considerations in design, oral written communications, teamwork, and the typical drawings and other deliverables produced during the scoping phase of process plant design. There is a particular emphasis on safety considerations in design. Prerequisites: CHE 303 and C or better in CHE 201, CHE 206, CHE 305 and CHE 321; Chemical Engineering majors only or permission of instructor. F.

CHE 412. Plant Design II: Process Project Engineering. 5 Credits.  
Principles gained in the development of the preliminary design for a major chemical process. In addition, this course provides an introduction to the second stage of process design—the conceptual design process including an introduction to Piping and Instrument-level design development, process control design and facility layout. A variety of oral communications skills are included. Prerequisites: CHE 408 and C or better in CHE 411; Chemical Engineering majors only or permission of instructor. S.

CHE 413. Plant Design II: Preliminary Process Project Engineering. 3 Credits.  
The major chemical process. A variety of oral communication skills are included. Prerequisites: CHE 411 with a C or better and CHE 408; Chemical Engineering majors only or permission of instructor. S.
CHE 414. Plant Design II: Conceptual Process Project Engineering. 2 Credits.
This course provides an introduction to the second stage of process design-conceptual design. Student will complete process-related components of a conceptual design for a major chemical process including Piping and Instrument Diagrams and Plant Layout Diagrams. A variety of oral communication skills are included. Prerequisites: CHE 413; Chemical Engineering majors only or permission of instructor. SS.

CHE 416. Chemical Product Design. 3 Credits.
Introduction to the design of chemical products. Topics include product development processes and methodologies, including StageGate and Design for Six Sigma (DFSS). Course contains both classroom and lab activities. Prerequisites: CHE 411, CHEM 340 and CHEM 340L or CHEM 341 and CHEM 341L; Chemical Engineering majors only or permission of instructor. S.

CHE 420. Capstone in Sustainable Energy. 1 Credit.
The student will work one-on-one with a faculty member to develop a concept paper on the primary issues facing the development and implementation of sustainable energy technologies. Prerequisite: Completion of 12 credit hours towards a Concentration in Sustainable Energy. S.

CHE 422. Capstone in Energetics. 1 Credit.
The student will work with a faculty mentor to develop a white paper on a major issue facing the development and implementation of energetics technologies. This will include a discussion of the technical, economic, political, and social barriers facing implementation of the selected technology(s) plus plausible methodologies of overcoming these barriers. Prerequisite: Completion of, or concurrent enrollment in, 12 credit hours towards a Concentration in Energetics. S.

CHE 424. Capstone in Petroleum Engineering. 1 Credit.
The student will work with a faculty mentor to develop a white paper on a major issue facing the development and implementation of petroleum engineering technologies. This will include a discussion of the technical, economic, political, and social barriers facing implementation of the selected technology(s) plus plausible methodologies of overcoming these barriers. Prerequisites: Completion of or concurrent enrollment in 12 credit hours towards a Concentration in Petroleum Engineering; restricted to Chemical Engineering majors. S/U grading. S.

CHE 431. Chemical Engineering Laboratory IV. 3 Credits.
Laboratory study of the unit operations of Chemical Engineering. Prerequisites: CHE 305 and either CHE 332 or CHE 335; Chemical Engineering majors only or permission of instructor. F,SS.

CHE 435. Materials and Corrosion. 3 Credits.
Provides an introduction to the fundamental properties of metals and polymers, reviews the forms of metal corrosion and of polymer degradation. Prerequisite: CEM majors only or permission of instructor. S.

CHE 480. Undergraduate Research. 1-6 Credits.
Undergraduate research experience in chemical engineering under the guidance of a faculty member. Prerequisite: Consent of instructor. Repeatable to 12 credits. S/U grading. F,S,SS.

CHE 489. Senior Honors Thesis. 1-8 Credits.
Supervised independent study culminating in a thesis. Repeatable to 9 credits. Repeatable to 9 credits. F,S,SS.

CHE 493A. Special Topics. 1-3 Credits.
Special topics dictated by student request and current faculty interest. The particular course may be initiated by the students by contacting members of the faculty. Regular grading. Repeatable to 9 credits. Repeatable to 9 credits. On demand.

CHE 493B. Special Topics. 1-3 Credits.
Special topics dictated by student request and current faculty interest. The particular course may be initiated by the students by contacting members of the faculty. S/U grading. Repeatable to 9 credits. Prerequisite: Consent of instructor. Repeatable to 9 credits. S/U grading. On demand.