Chemical Engineering (CHE)

B.S. in Chemical Engineering (https://catalog.und.edu/undergraduateacademicinformation/departmentalcoursesprograms/chemicalengineering/ce-bs/)

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Freshman Year		
Fall		**Credits**
CHE 102	Introduction to Chemical Engineering	2
CHEM 221 & 221L	Fundamentals of Chemistry - Concepts and Fundamentals of Chemistry Laboratory [1]	4
ENGL 110	College Composition I	3
MATH 165	Calculus I	4
Essential Studies: Arts & Humanities		3
	Credits	**16**
Spring		
CHE 103	Computing Tools for Chemical Engineers	3
CHEM 254 & 254L	Inorganic Chemistry I and Inorganic Chemistry I Laboratory [1]	4
MATH 166	Calculus II	4
PHYS 251	University Physics I	4
	Credits	**15**
Sophomore Year		
Fall		
CHE 201	Chemical Engineering Fundamentals	3
ENGL 130	Composition II: Writing for Public Audiences	3
LEAD 101	Learning Leadership	3
MATH 265	Calculus III	4
PHYS 252	University Physics II	4
	Credits	**17**
Spring		
CHE 206	Unit Operations in Chemical Engineering	3
CHE 232	Chemical Engineering Laboratory I [2]	2
CHE 315	Engineering Statistics and Design of Experiments	3
CHEM 340 & 340L	Survey of Organic Chemistry and Survey of Organic Chemistry Laboratory [3]	5
MATH 266	Elementary Differential Equations	3
	Credits	**16**
Junior Year		
Fall		
CHE 301	Introduction to Transport Phenomena	4
CHE 303	Chemical Engineering Thermodynamics	4
CHE 331	Chemical Engineering Laboratory II [2]	2
ENGR 206	Fundamentals of Electrical Engineering	3
Essential Studies: Arts & Humanities		3
	Credits	**16**
Spring		
CHE 305	Separations	3
CHE 321	Chemical Engineering Reactor Design	3
CHE 332	Chemical Engineering Laboratory III [2]	2
ENGR 340	Professional Integrity in Engineering	3
Material Science Elective		3
Technical Elective		3
	Credits	**17**
Senior Year		
Fall		
CHE 408	Process Dynamics and Control	3
CHE 411	Plant Design I: Process Design and Economics	4
CHE 431	Chemical Engineering Laboratory IV	3
CHEM 466 or CHE 403	Fundamentals of Physical and Biophysical Chemistry or Molecular Thermodynamics and Kinetics	3
Advanced Chemical Science Elective		3
	Credits	**16**
Spring		
CHE 412	Plant Design II: Process Project Engineering [4]	5
CHE 416	Chemical Product Design	3
Essential Studies: Arts & Humanities		3
Advanced Chemical Science Elective		3
Essential Studies: Social Science		3
	Credits	**17**
	Total Credits	**130**

1 CHEM 121/121L may be taken in lieu of CHEM 221/221L and CHEM 122/122L may be taken in lieu of CHEM 254/254L. 2 CHE 235 and CHE 335 may be taken in lieu of the CHE 232, CHE 331, CHE 332 sequence. 3 CHEM 341/341L may be taken in lieu of CHEM 340/340L. 4 CHE 413/414 may be taken in lieu of CHE 412.

Students must complete enough electives to bring total credit hours up to the 125. Special Emphasis courses can fulfill an essential studies requirement (example-History 104, US History, will count toward the US Diversity as well as the Humanities area). Please Note: Every student must fulfill all University, Departmental, and Essential Studies requirements. (https://und.edu/academics/essential-studies/)

CHE 102. Introduction to Chemical Engineering. 2 Credits.
An introduction to the chemical engineering profession. Also includes introduction to dimension analysis, material balances, unit operations, safety and engineering economics. Prerequisite: CEM major or permission of instructor. F.

CHE 103. Computing Tools for Chemical Engineers. 3 Credits.
Use of spreadsheets, equation-solving packages, and process simulation software to effectively communicate and solve chemical engineering problems. Introduction to chemical process engineering principles. Prerequisite: CEM major or permission of instructor. Prerequisite or Corequisite: MATH 165. S.

CHE 201. Chemical Engineering Fundamentals. 3 Credits.
Introductory principles of stoichiometry with emphasis directed to material and energy balances involved in chemical processes. Prerequisite: CHEM 122 or CHEM 254; CEM majors only or permission of instructor. F,S.

CHE 206. Unit Operations in Chemical Engineering. 3 Credits.
Application of the principles of momentum and heat transfer from a unit operations perspective. Prerequisite: CHE 201, CEM majors only or permission of instructor. S.

CHE 232. Chemical Engineering Laboratory I. 2 Credits.
The use and application of apparatus to measure the physical and chemical properties involved in chemical process material and energy balances. Prerequisite: CEM majors only or permission of instructor. Prerequisite or Corequisite: CHE 201. S.

CHE 235. Chemical Engineering Summer Laboratory I. 3 Credits.
The use and application of apparatus to measure the physical and chemical properties involved in chemical process material and energy balances and fluid flow. Prerequisite: CHE 201, CHE 206 and CHE 315; CEM majors only or permission of instructor. SS.

CHE 301. Introduction to Transport Phenomena. 4 Credits.
An analytical study of the transport of momentum, energy and mass; derivation and utilization of the differential equations of change. Prerequisite: CHE 201 with a grade of C or better; Chemical Engineering majors only or permission of instructor. Prerequisite or Corequisite: MATH 266. F.

CHE 303. Chemical Engineering Thermodynamics. 4 Credits.
Thermodynamics applied to chemical engineering with emphasis on computational work, including thermodynamic laws, chemical equilibria and pressurevolume-temperature relationships. Prerequisite: CHE 201 with a grade of C or better; Chemical Engineering majors only or permission of instructor. F.

CHE 305. Separations. 3 Credits.
Theory and application of rate-based and equilibrium-staged separations. Prerequisite: CHE 201 with a grade of C or better and CHE 303; Chemical Engineering majors only or permission of instructor. Prerequisite or Corequisite: CHE 206. S.

CHE 315. Engineering Statistics and Design of Experiments. 3 Credits.
Statistical background needed to plan, conduct, and analyze engineering experiments. Topics include propagation of error, confidence intervals, hypothesis testing, linear regression, analysis of variance, and an introduction to statistical design of experiments. Prerequisite: CEM majors only or permission of instructor. Prerequisite or Corequisite: MATH 265. S.

CHE 321. Chemical Engineering Reactor Design. 3 Credits.
Theory of chemical reaction rates. Design of batch, tubular, CSTR and catalytic chemical reactors. Prerequisite: CHE 206, MATH 266 and C or better in CHE 201; Chemical Engineering majors only or permission of instructor. S.

CHE 331. Chemical Engineering Laboratory II. 2 Credits.
Experiments illustrating physico-chemical principles and the application of fluid flow and heat transfer theory. Prerequisite: 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. Prerequisite: 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. Prerequisite: 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 9.00 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 9.00 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 12.00 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. Prerequisite: 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. Prerequisite: CHE 206, CHE 305, and CHE 321; 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. Prerequisite: 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.
Proficiency is 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. Prerequisite: 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.
Proficiency is gained in the development of the preliminary design for a major chemical process. A variety of oral communication skills are included. Prerequisite: 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. Prerequisite: 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 develop processes and methodologies, including StageGate and Design for Six Sigma (DFSS). Course contains both classroom and lab activities. Prerequisite: 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. Prerequisite: 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. Prerequisite: 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 degradations. 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 12.00 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 9.00 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 9.00 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 9.00 credits. S/U grading. On demand.