

CHEMICAL ENGINEERING

Description

The mission of the University of Nebraska–Lincoln Chemical and Biomolecular engineering program (<https://engineering.unl.edu/chme/>) is to provide qualified students with a foundation in engineering sciences and engineering design methods to prepare them for successful professional careers and to contribute to the needs of society.

Program Educational Objectives

In pursuit of the program's mission, the Department of Chemical and Biomolecular Engineering has established the Educational Objectives given below.

Succeeds professionally. Graduates will succeed professionally by making positive contributions to address the needs of society, generate new knowledge, and provide leadership in their respective industry or field.

Solves engineering and scientific challenges. Graduates will use critical thinking, engineering techniques, and engineering strategies to develop sustainable solutions associated with technical challenges, with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Communicates effectively to diverse audiences. Graduates will use effective written and verbal communication skills with broad and diverse audiences while demonstrating respect for different perspectives.

Contributes on a team. Graduates will work collaboratively in team-based environments to provide solutions to problems.

Acts safely and ethically. Graduates will complete responsibilities in a safe, ethical, and professional manner while considering the impact on global, economic, environmental, and societal contexts. Graduates will uphold the American Institute of Chemical Engineers (AIChE) Code of Ethics and will influence others to do the same.

Exhibits self-management and leadership. Graduates will lead and manage themselves, teams, organizations, and projects.

Engages in lifelong learning. Graduates will engage in self-initiated, lifelong learning for professional growth in their chosen career paths.

The Department of Chemical and Biomolecular Engineering offers a course of study designed for students who plan careers in a wide variety of industries, ranging from the chemical and process industries to biotechnology, electronics, and the environment. Students receive training in the basic subjects of mathematics, English, and physics like other engineering students, but in addition receive extensive training in chemistry. In various courses, the emphasis is placed on the fundamental principles of fluid mechanics, heat transfer, mass transfer, separation processes, thermodynamics, kinetics, and process dynamics, as well as process economics and design of chemical processes.

The instructional laboratories provide opportunities for students to operate experimental equipment, test the theories and correlations developed in the classroom, and design their own experimental equipment for the solution of special problems.

Graduates are qualified to undertake work in research, design, development, production, maintenance, and technical sales in a wide variety of industries including chemicals, petroleum, petrochemicals,

rubber, plastics, agricultural chemicals, food, biotechnology, pharmaceuticals, paper, fabrics, aircraft, automotive, electronics, energy conversion, and environmental pollution prevention and control.

The Department of Chemical and Biomolecular Engineering is located in Othmer Hall. A state-of-the-art unit operations laboratory, used to give hands-on chemical process experience, is located there. Laboratory equipment is provided for the study of fluid mechanics, heat transfer, mass transfer, staged operations, process control, thermodynamics, reaction kinetics, and polymerization. The department operates its own microcomputer facility. Additional research equipment is available for independent and graduate study in several areas.

Major Department Admission

To earn Professional Admission to the chemical engineering degree program, a student must complete a minimum of 43 credit hours applicable to the chemical engineering degree and complete CHME 202 Mass and Energy Balances with a grade of C- or higher. The student must have a cumulative GPA of 2.4 or higher to be professionally admitted. The faculty of the chemical and biomolecular engineering department reviews students for professional admission once they have earned 43 credit hours and completed CHME 202. A student may be reviewed twice for professional admission to chemical engineering. If the student is denied professional admission to chemical engineering twice, then the student will be required to change their major and will not be allowed to complete a chemical engineering degree. After the student is awarded professional admission to chemical engineering, they will be allowed to enroll in the appropriate 300- and 400-level engineering courses.

Other

University Honors Program

For those students who have been admitted to the University Honors Program, junior- and senior-level chemical and biomolecular engineering classes are available as honors-designated classes (i.e., CHME xxxH) on a "contract basis" between the student and the instructor with approval by the department faculty. The requirement of an honors thesis research project is fulfilled by the completion of a minimum of 3 credits of CHME 499H Honors Thesis under the direction of a department faculty member. Additional information on the University Honors Program, including admission requirements, can be found in the Honors Program section.

College Requirements

College Admission

College Entrance Requirements

Students must have high school credit for (one unit is equal to one high school year):

1. Mathematics – 4 units: 2 of algebra, 1 of geometry, and 1 of precalculus and trigonometry
2. English – 4 units
3. Natural sciences – 3 units that must include 1 unit of physics and 1 unit of chemistry (chemistry requirement waived for students in construction management or computer science)
4. Foreign language – 2 units of a single foreign language
5. Social studies – 3 units
6. Students having a composite ACT score of 28 or greater (or equivalent SAT score) will be admitted to the College of Engineering

even if they lack any one of the following: trigonometry, chemistry, or physics. Students without test scores who are missing a full unit of trigonometry/pre-calculus/calculus or chemistry or physics will be evaluated through College Review.

7. Students having an ACT score of 19 or less in English (or equivalent SAT score) or a grade lower than B in high school English, must take ENGL 150 Writing and Inquiry or ENGL 151 Writing and Argument.

A total of 16 units is required for admission.

Engineering requires that student performance meet one of the following standards: composite ACT of 24, SAT of 1180, ACT Math subscore of 24, SAT Math subscore of 580, or a 3.5 cumulative GPA.

Any domestic first-year student who does not gain admission to Engineering but does gain admission to the University of Nebraska-Lincoln (UNL) will be reviewed through College Review. College Review is conducted through the College Review Committee which considers factors beyond standardized testing. Any first-year student who is not admitted through college review is placed in Pre-Engineering (PENG) with the Exploratory and Pre-Professional Advising Center (Explore Center). Students in the Explore Center can transfer to the College of Engineering once college admission requirements are met.

Students for whom English is not their language of nurture must meet the minimum English proficiency requirements of the University.

Students who lack entrance units may complete precollege training by Independent Study through the University of Nebraska-Lincoln Office of On-line and Distance Education, in summer courses, or as a part of their first or second semester course loads while in the Explore Center or other colleges at UNL.

Students should consult their advisor, their department chair, or Engineering Student Services (ESS) if they have questions on current policies.

Other Admission Requirements

Students who transfer to the University of Nebraska-Lincoln from other accredited colleges or universities and wish to be admitted to the College of Engineering (COE) must meet COE first-year student entrance requirements, have a minimum cumulative GPA of 2.5, and be calculus-ready. Students not meeting either of these requirements must enroll in the Explore Center or another University college until they meet COE admission requirements. Students transferring from UNO, UNL, or UNK to the College of Engineering must be in good academic standing with their institution.

The COE accepts courses for transfer for which a C or better grade was received. Although the University of Nebraska-Lincoln accepts D grades from the University of Nebraska Kearney and the University of Nebraska Omaha, not all majors in the COE accept such low grades. Students must conform to the requirements of their intended major and, in any case, are strongly encouraged to repeat courses with a grade of C- or less.

Students who were previously admitted to COE and are returning to the College of Engineering must demonstrate a cumulative GPA of 2.5 to be readmitted to COE.

College Degree Requirements

Grade Rules

Grade Appeals

In the event of a dispute involving any college policies or grades, the student should appeal to their instructor, and appropriate department chair or school director (in that order). If a satisfactory solution is not achieved, the student may appeal their case through the College Academic Appeals Subcommittee.

Catalog Rule

Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted at the University of Nebraska-Lincoln. In consultation with advisors, a student may choose to follow a subsequent catalog for any academic year in which they are admitted to and enrolled as a degree-seeking student at Nebraska in the College of Engineering. Students must complete all degree requirements from a single catalog year. The catalog which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Students who have transferred from a community college may be eligible to fulfill the requirements as stated in the catalog for an academic year in which they were enrolled at the community college prior to attending the University of Nebraska-Lincoln. This decision should be made in consultation with the student's College of Engineering academic advising team (e.g., ESS professional advisor and the chief faculty advisor for the student's declared degree program). The chief faculty advisor has the final authority for this decision. Eligibility is based on a) enrollment in a community college during the catalog year the student wishes to utilize, b) maintaining continuous enrollment of at least 12 credit hours per semester at the previous institution for at least 2 semesters, and c) continuous enrollment at the University of Nebraska-Lincoln within 1 calendar year from the student's last term at the previous institution. Students must complete all degree requirements from a single catalog year and within the timeframe allowable for that catalog year.

Learning Outcomes

Graduates of the chemical engineering program will have:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

The above student outcomes have been approved by the ABET Engineering Area Delegation for use beginning with the 2019-20 academic year, and have been adopted by the faculty of the Department of Chemical and Biomolecular Engineering.

Major Requirements

Specific Major Requirements

Any student in the chemical and biomolecular engineering program whose grade point average in required chemical and biomolecular engineering courses is less than 2.4 will be admitted to the required courses of the following year only with the special permission of the department.

First Semester

CHEM 113A & CHEM 113L	Fundamental Chemistry I and Fundamental Chemistry I Laboratory ¹	4
CHME 113	Introduction to Chemical Engineering I	2
ENGR 10	Freshman Engineering Seminar	0
MATH 106	Calculus I	5
ACE 2 Elective		3

Select one of the following:

ALEC 102	Interpersonal Skills for Leadership	
COMM 286	Business and Professional Communication (SLO 2)	
ENGR 100	Interpersonal Skills for Engineering Leaders	
JGEN 300	Technical Communication II	
ACE 5 Elective ²		3
Credit Hours Subtotal:		17

Second Semester

CHME 114	Introduction to Chemical Engineering II	2
CHEM 114	Fundamental Chemistry II ¹	3
JGEN 200	Technical Communication I	3
MATH 107	Calculus II	4
PHYS 211	General Physics I	4
Credit Hours Subtotal:		16

Third Semester

CHEM 261 & CHEM 263A	Organic Chemistry and Mechanistic Organic Chemistry I Laboratory	4
CHME 202	Mass and Energy Balances	3
ENGR 20	Sophomore Engineering Seminar	0
MATH 208	Calculus III	4
PHYS 212	General Physics II	4
ACE 6 Elective ²		3
Credit Hours Subtotal:		18

Fourth Semester

CHEM 262 & CHEM 264A	Organic Chemistry and Mechanistic Organic Chemistry II Laboratory	4
CHME 223	Chemical Engineering Thermodynamics I	3
ECEN 211	Elements of Electrical Engineering I	3

CHME 212	Introduction to Chemical Engineering Computation	3
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MATH 221	Differential Equations	3
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Credit Hours Subtotal:		16
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Fifth Semester

CHEM 221A & CHEM 221L	Elementary Quantitative Analysis and Elementary Quantitative Analysis Laboratory	5
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CHME 312	Chemical Engineering Computation	3
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CHME 323	Chemical Engineering Thermodynamics and Kinetics	3
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CHME 331	Equilibrium Stage Operations	3
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CHME 332	Transport Operations I	3
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Credit Hours Subtotal:		17
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Sixth Semester

CHME 330	Chemical Engineering Laboratory I	3
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CHME 333	Transport Operations II	3
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CHME 334	Transport Operations III	3
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Advanced Chemistry

Select one of the following:		3
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CHEM 421	Analytical Chemistry	
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CHEM 431 / BIOC 431 / BIOS 431	Biochemistry I: Structure and Metabolism	
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CHEM 441	Inorganic Chemistry	
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ACE 7 Elective ²		3
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Credit Hours Subtotal:		15
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Seventh Semester

CHME 442	Chemical Reactor Engineering and Design	3
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CHME 452	Chemical Engineering Process Economics and Optimization	3
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CHME 460	Automatic Process Control Laboratory	1
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CHME 462	Automatic Process Control	3
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ENGR 400	Professional Ethics and Social Responsibilities	1
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ACE 8 Elective ²		3
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CHME Technical Electives ³		3
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Select one of the following:

CHME 324	Molecular Processes and Applications	
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CHME 371	Stem Cell Engineering and Regenerative Medicine	
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CHME 409	Process Intensification and Sustainability	
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CHME 412	Introduction to Atomistic Simulations	
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CHME 447	Principles and Applications of Catalysis in Reaction Engineering	
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CHME 470	Biomanufacturing Laboratory	
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CHME 473	Biochemical Engineering	
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CHME 474	Advanced Biochemical Engineering	
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CHME 475	Biochemical Separations	
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CHME 476	Micro/Nano systems for Engineering and Life Sciences	
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CHME 477	Molecular Bioengineering	
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CHME 482	Polymers	
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CHME 483	Chemical Processes in Semiconductor Manufacturing	
CHME 486	Electrochemical Engineering	
CHME 489	Air Pollution, Assessment and Control	
Credit Hours Subtotal:		17
Eighth Semester		
CHME 420	Chemical Process Safety	3
CHME 430	Chemical Engineering Laboratory II	4
CHME 453	Chemical Engineering Process Design and Safety	3
Technical Elective ³		3
ACE 9 Elective ²		3
Credit Hours Subtotal:		16
Total Credit Hours		132

¹ The sequence CHEM 109A and CHEM 109L and CHEM 110A and CHEM 110L is an acceptable alternative to CHEM 113A and CHEM 113L and CHEM 114.

² Choose one course each from ACE outcomes 5, 6, 7, 8, and 9 elective courses. BSEN 206, ACE 8, is not degree applicable.

³ The 6 hours of technical electives must be approved by the advisor.

Tracks/Options/Concentrations/Emphases Requirements

Special emphasis options available in the Department of Chemical and Biomolecular Engineering include:

- Biotechnology/Bioengineering
- Environmental Engineering
- Materials Engineering
- Mathematics and Statistics

Technical Electives

The purpose of technical electives is to provide the student with an opportunity to gain new knowledge in an area of engineering or science beyond the basic undergraduate chemical engineering program. The technical electives may be in engineering design, engineering science, physical science, life science, and/or math.

- A minimum of 6 credit hours of technical electives are required.
- All technical electives must be approved by a departmental academic advisor prior to registration for the course.
- Students are expected to complete their technical elective requirements during their junior and senior years with corresponding level of courses.
- With the pre-approval of the student's academic advisor, a maximum of 3 credit hours of CHME 499 Senior Problems or CHME 499H Honors Thesis may be applied toward the technical electives requirement.
- Introductory 100-level courses are not accepted as technical electives.
- Advanced Placement (AP) high school classes are not allowed as technical electives.
- Courses lacking a quantitative physical science foundation such as accounting, marketing, economics, or law are normally not acceptable as technical electives.
- Students are strongly encouraged to select their technical electives from the following list. Course(s) may be taken outside

of this list with approval of a departmental academic advisor prior to registration for the course.

Biotechnology/Bioengineering/Chemistry

BIOS 206	General Genetics	4
BIOS 213	Human Physiology	3
BIOS 214	Human Anatomy	5
BIOS 312	Microbiology	3
CHEM 431 / BIOC 431 / BIOS 431	Biochemistry I: Structure and Metabolism	3
CHEM 432 / BIOC 432 / BIOS 432	Biochemistry II: Metabolism and Biological Information	3
CHEM 441	Inorganic Chemistry	3
CHEM 471	Physical Chemistry	4
CHEM 481	Physical Chemistry I	4
CHEM 482	Physical Chemistry II	4
CHEM 486 / BIOC 486	Advanced Topics in Biophysical Chemistry	3
CHME 412	Introduction to Atomistic Simulations	3
CHME 470	Biomufacturing Laboratory	3
CHME 473	Biochemical Engineering	3
CHME 474	Advanced Biochemical Engineering	2-6
CHME 475	Biochemical Separations	3
CHME 476	Micro/Nano systems for Engineering and Life Sciences	3
CHME 477	Molecular Bioengineering	3

Environmental Engineering

BSEN 455 / CIVE 455	Nonpoint Source Pollution Control Engineering	3
CHEM 421	Analytical Chemistry	3
CHEM 423	Analytical Chemistry Laboratory	2
CHME 489	Air Pollution, Assessment and Control	3
CIVE 321 / BSEN 321	Principles of Environmental Engineering	3
CIVE 321L / BSEN 321L	Environmental Engineering Laboratory	1
CIVE 422 / BSEN 422	Pollution Prevention: Principles and Practices	3
CIVE 424	Solid and Hazardous Waste Management	3

Materials Engineering

CHME 482	Polymers	3
MATL 260	Elements of Materials Science	3
MATL 360	Elements of Materials Science	4
MATL 460	Mechanical Aspects of Materials	3
MATL 462	X-ray Diffraction	3
MATL 469	Physical Materials Systems	3
MATL 471	Electron Microscopy of Materials	3
MATL 473	Corrosion	3
MECH 325	Mechanics of Elastic Bodies	3
MECH 381	Elements of Computer-Aided Design	3

PHYS 422 /	Introduction to Physics and Chemistry of	3
ECEN 422	Solids	

Mathematics and Statistics

MATH 424	Introduction to Partial Differential Equations	3
STAT 380	Statistics and Applications	3

Additional Major Requirements

Grade Rules

GPA Requirements

Any student in the chemical and biomolecular engineering program whose grade point average in required chemical and biomolecular engineering courses is less than 2.4 will need special permission from the department to be admitted to the required CHME courses the following year.

CHME 113 Introduction to Chemical Engineering I

Description: The profession of chemical engineering. Chemical engineers' impact on today's societal issues, team problem solving, communication skills, and the introduction of chemical process flow sheets.

Credit Hours: 2

Max credits per semester: 2

Max credits per degree: 2

Grading Option: Graded with Option

CHME 114 Introduction to Chemical Engineering II

Prerequisites: MATH 106 or parallel, CHEM 109A and 109L or CHEM 113A and 113L or parallel

Description: Analytical and computational methods for solving problems related to chemical process measurements, properties of single compounds, properties of mixtures, stoichiometry.

Credit Hours: 2

Max credits per semester: 2

Max credits per degree: 2

Grading Option: Graded with Option

Prerequisite for: CHME 202

CHME 202 Mass and Energy Balances

Prerequisites: A grade of C- or better in CHME 114; MATH 107 or parallel.

Description: Application of the principle of conservation of mass and energy in the analysis of steady-state chemical processes. Topics in physical, chemical, and thermal property estimation.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Graded with Option

Prerequisite for: CHME 212; CHME 223; ENVE 410

CHME 204 Carbon Footprints: From Greenhouse Gases to Global Warming

Prerequisites: MATH 101, 103, or Placement into MATH 102 or above.

Description: Introduction to the concepts of carbon footprints of various human activities, household items and devices, and basic calculations of "carbon accounting". Discuss the global, regional and local impact of carbon accounting.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Graded with Option

ACE: ACE 4 Science

CHME 212 Introduction to Chemical Engineering Computation

Prerequisites: MATH 107 or MATH 107H, CHME 202

Description: Numerical solution of linear and nonlinear systems of equations, matrix eigenvalue analysis, linear programming and optimization, data regression and model identification. Numerical methods and mathematical packages such as MATLAB that form the basis for computational methods will be emphasized.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Graded

Prerequisite for: CHME 312

CHME 223 Chemical Engineering Thermodynamics I

Prerequisites: A grade of C- or better in CHME 202.

Description: Application of the three fundamental laws to chemical engineering problems.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Graded with Option

Prerequisite for: CHME 331; CHME 332

CHME 312 Chemical Engineering Computation

Prerequisites: MATH 221, CSCE 155N or CHME 212

Description: Computational methods in orthogonal polynomials, numerical integration, matrix operations and ordinary differential equations as they apply to chemical engineering problems such as separations, reactor design, transport operations and control.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Graded with Option

Prerequisite for: CHME 330; CHME 333

CHME 323 Chemical Engineering Thermodynamics and Kinetics

Crosslisted with: CHME 823

Prerequisites: CHME 223

Description: Application to multi-component systems; thermodynamics, phase equilibria, chemical reaction equilibria, and process analysis.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Graded with Option

Prerequisite for: CHME 324; CHME 805; CHME 825; CHME 845; CHME 847, CHME 447; CHME 935; CHME 995

CHME 324 Molecular Processes and Applications

Prerequisites: CHME 323 or parallel

Description: Microscopic processes, such as statistical thermodynamics and molecular kinetics are introduced. Emphasis is placed on an engineering approach to developing problem-solving skills in systems requiring molecular-level understanding.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Graded with Option

CHME 330 Chemical Engineering Laboratory I**Prerequisites:** CHME 331, 332; CHME 312, 333 or parallel**Description:** Selected experiments in chemical engineering thermodynamics, heat and momentum transfer, and separations. Emphasis on interpretation of results and written reports.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Course and Laboratory Fee:** \$25**CHME 331 Equilibrium Stage Operations****Prerequisites:** MATH 107; CHME 223**Description:** Phase equilibrium and mass and energy balances applied to staged mass transfer operations.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** CHME 330; CHME 408**CHME 332 Transport Operations I****Prerequisites:** MATH 208; CHME 223**Description:** Macroscopic and microscopic phenomena in fluid mechanics applied to chemical processes. Basic conservation laws, flow kinematics, laminar flow, non-viscous and viscous flow of incompressible fluids, and boundary layer theory.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** AGEN 325, BSEN 325; AGEN 344, BSEN 344; CHME 330; CHME 333; CHME 334; CHME 420; CHME 835; CIVE 420; ENVE 410**CHME 333 Transport Operations II****Prerequisites:** CHME 312, CHME 332**Description:** Heat transfer by conduction, convection, and radiation applied to chemical and biochemical processes. Heat exchanger design and performance.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** CHME 408; CHME 475, CHME 875; CHME 815; CHME 835; CHME 935; CHME 995**CHME 334 Transport Operations III****Prerequisites:** CHME 332**Description:** Diffusive and convective transport of chemical species applied to chemical and biochemical processes including reaction and separation.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** CHME 408**CHME 371 Stem Cell Engineering and Regenerative Medicine****Crosslisted with:** CHME 871**Prerequisites:** CHEM 109A and 109L or CHEM 113A and 113L.**Description:** Introduction to stem cells and regenerative medicine with emphasis on stem cells and their application in the treatment of diseases and translational lab-to-clinic hurdles in stem cell therapy**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CHME 408 Product Design and Development****Prerequisites:** CHME 333, CHME 331, CHME 434**Description:** Analysis of product design and development with the function of the product required by customers. Brainstorming toward creative models and prototypes from initial concept to completion with a feasibility study.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Offered:** FALL/SPR**CHME 409 Process Intensification and Sustainability****Crosslisted with:** CHME 809**Prerequisites:** Senior Standing**Description:** Process intensification focuses on considerable improvements in tens to hundred percent in manufacturing by modification of existing operations or new designs. Optimization of manufacturing processes is at the core of PI**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Offered:** FALL/SPR**CHME 412 Introduction to Atomistic Simulations****Crosslisted with:** CHME 812**Prerequisites:** Senior standing**Description:** Theory and application of quantum-based computational methods used to model, predict and analyze materials properties.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CHME 420 Chemical Process Safety****Prerequisites:** CHME 332**Description:** Introduction to chemical process safety with topics emphasizing industrial hygiene, toxicology, hazard identification, inherently safer design, and engineering controls.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Offered:** FALL/SPR

CHME 430 Chemical Engineering Laboratory II**Crosslisted with:** CHME 830**Prerequisites:** CHME 330; CHME 442 or parallel; CHME 462 or parallel.**Description:** Selected experiments in chemical engineering. Emphasis on experimental design, interpretation of results, and formal oral and written presentation.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Graded with Option**Course and Laboratory Fee:** \$25**Experiential Learning:** Case/Project-Based Learning**CHME 442 Chemical Reactor Engineering and Design****Crosslisted with:** CHME 842**Prerequisites:** CHME 323**Description:** Basic principles of chemical kinetics are coupled with models descriptive of rates of energy and mass transfer for the analysis and design of reactor systems.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** CHME 845**CHME 447 Principles and Applications of Catalysis in Reaction Engineering****Crosslisted with:** CHME 847**Prerequisites:** CHME 323.**Description:** Principles and applications of heterogeneous catalysis, mechanisms, catalytic reactor types and catalyst characterization and performance. Case studies on current catalytic technologies.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CHME 452 Chemical Engineering Process Economics and Optimization****Crosslisted with:** CHME 852**Prerequisites:** CHME 333, CHME 331, CHME 434**Notes:** Credit toward the degree may be earned only in CHME 452/852**Description:** Criteria of chemical process economics: cost and asset accounting, time value of money, profitability, alternative investments, minimum attractive rate of return, sensitivity and risk analysis. Process optimization in: plant operations, unit operations, using successive calculations, linear programming and dynamic programming.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CHME 453 Chemical Engineering Process Design and Safety****Crosslisted with:** CHME 853**Prerequisites:** CHME 452**Description:** Design, evaluation, and safety considerations of chemical engineering process applications.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**ACE:** ACE 10 Integrated Product**Experiential Learning:** Case/Project-Based Learning**CHME 454 Chemical Process Engineering****Crosslisted with:** CHME 854**Prerequisites:** CHME 430, CHME 312**Description:** Practical and theoretical aspects of chemical process analysis, simulation, and synthesis. Case studies used to illustrate principles. Use of the digital computer as a tool of the process engineer is stressed.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CHME 460 Automatic Process Control Laboratory****Crosslisted with:** CHME 860**Prerequisites:** Parallel: CHME 462.**Description:** Selected laboratory experiments to demonstrate the theory of the dynamics and control of chemical processes.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Graded with Option**Course and Laboratory Fee:** \$25**CHME 462 Automatic Process Control****Crosslisted with:** CHME 862**Prerequisites:** MATH 221, CHME 333**Description:** Analysis and design of automatic control systems. Dynamic responses of measuring instruments, control elements, stability of control systems, and process equipment included in control loops.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** CHME 965**CHME 470 Biomanufacturing Laboratory****Prerequisites:** CHME 473**Description:** Selected experiments in molecular biology, bioprocess development, fermentation, purification, and analytical methods as they pertain to biomanufacturing.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CHME 473 Biochemical Engineering****Crosslisted with:** CHME 873**Prerequisites:** CHEM 262, CHEM 431**Description:** Engineering processes for production of biologics and metabolic products, with emphasis on biopharmaceutical production by bacteria, yeast, and mammalian systems.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** CHME 470; CHME 474, CHME 874

CHME 474 Advanced Biochemical Engineering**Crosslisted with:** CHME 874**Prerequisites:** CHME 473/873.**Description:** Recent theoretical and technical developments in biochemical engineering.**Credit Hours:** 2-6**Min credits per semester:** 2**Max credits per semester:** 6**Max credits per degree:** 6**Grading Option:** Graded with Option**CHME 475 Biochemical Separations****Crosslisted with:** CHME 875**Prerequisites:** CHME 333/833**Description:** Separation and purification of compounds of biological origin from an analytical perspective. Application of unit operations for these separations.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CHME 476 Micro/Nano systems for Engineering and Life Sciences****Crosslisted with:** CHME 876**Prerequisites:** Senior standing**Description:** Introduction to a number of biological problems facing living systems and show how micro/nanotechnology is being used to solve those problems. Emphasis on engineering perspectives of the life sciences.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CHME 477 Molecular Bioengineering****Crosslisted with:** CHME 877**Prerequisites:** Senior standing or permission.**Description:** Introduction to fundamentals and up-to-date developments in the field of bioengineering at the molecular level. Topics to cover include recombinant DNA methods, protein engineering, microbial cell factories, synthetic and systems biology, DNA and protein therapeutics.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Offered:** FALL/SPR**CHME 482 Polymers****Crosslisted with:** CHME 882**Prerequisites:** CHEM 262, 264 or 264A, and MATH 221**Description:** Introduction to polymer synthesis, structure, polymer physics, thermodynamics, kinetics, polymer characterization techniques, polymer properties and applications.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CHME 483 Chemical Processes in Semiconductor Manufacturing****Crosslisted with:** CHME 883**Prerequisites:** A grade of C or better in ECEN 211 and MATH 208**Description:** Introduction to the basic chemical processes used in chip manufacturing, with emphasis on: thin-film metal and dielectric deposition, etching, ion implantation, diffusion, lithography, and planarization. Discuss material synthesis and processing and the principle physical/chemical governing phenomena.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CHME 486 Electrochemical Engineering****Crosslisted with:** CHME 886**Prerequisites:** CHME 223 or MECH 200 or BSEN 244**Description:** Thermodynamic and kinetic principles of electrochemistry are applied to the design and analysis of electrochemical processes, including chemical production, batteries, fuel cells, and corrosion prevention.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CHME 489 Air Pollution, Assessment and Control****Crosslisted with:** CHME 889**Prerequisites:** Senior standing**Description:** Survey of the present status of the air pollution problem and the application of engineering and scientific principles to its practical and effective coordinated control.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**CHME 496 Advanced Topics in Chemical Engineering Computation****Crosslisted with:** CHME 896**Prerequisites:** CHME 312 or CSCE 455/855 or MECH 480/880, and permission.**Description:** Intensive treatment of special topics of current research interest in such areas as steady-state and dynamic process simulation, design optimization, chemical process synthesis, computer-aided product research, stochastic optimization, and numerical methods applied to transport problems.**Credit Hours:** 1-6**Min credits per semester:** 1**Max credits per semester:** 6**Max credits per degree:** 6**Grading Option:** Graded with Option**Prerequisite for:** CHME 915**CHME 499 Senior Problems****Prerequisites:** Senior standing in chemical engineering.**Description:** Research and development problems which include literature surveys, equipment design and operation, and development of correlations.**Credit Hours:** 1-6**Min credits per semester:** 1**Max credits per semester:** 6**Max credits per degree:** 6**Grading Option:** Graded with Option

CHME 499H Honors Thesis

Prerequisites: Senior standing in chemical engineering, admission to the University Honors Program.

Description: Honors thesis research project meeting the requirements of the University Honors Program. Independent research project executed under the guidance of a member of the faculty of the Department of Chemical Engineering which contributes to the advancement of knowledge in the field. Culminates in the presentation of an honors thesis to the department and college.

Credit Hours: 1-6

Min credits per semester: 1

Max credits per semester: 6

Max credits per degree: 6

Grading Option: Graded

PLEASE NOTE

This document represents a sample 4-year plan for degree completion with this major. Actual course selection and sequence may vary and should be discussed individually with your college or department academic advisor. Advisors also can help you plan other experiences to enrich your undergraduate education such as internships, education abroad, undergraduate research, learning communities, and service learning and community-based learning.

Career Information

The following represents a sample of the internships, jobs and graduate school programs that current students and recent graduates have reported.

Jobs of Recent Graduates

- Production Engineer, Archer Daniels Midland - Decatur, IL
- Project Engineer, Cargill - Blair, NE
- Process Engineer, ExxonMobil Chemical - Beaumont, TX
- Process Engineer, Becton Dickinson - Columbus, NE
- Assistant Chemical Engineer, Burns and McDonnell - Kansas City, MO
- Engineer, Hospira - McPherson, KS
- Process Engineer, Koch Industries - Wichita, KS
- Chemical Engineer I, Black & Veatch - Kansas City, KS
- Process Engineer, POET - Sioux Falls, SD
- Environmental Operations Process Engineer, Syngenta - Baton Rouge, LA
- Process Engineer, Vishay Intertechnologies - Columbus, NE
- Optimized Operations Engineer, 3M - Nevada, MO
- Design Engineer, Chevron - Richmond, CA
- Process Engineer, ConAgra - Council Bluffs, IA
- Associate Maintenance Engineer, Hormel Foods - Lincoln, NE
- Manufacturing Engineer, Procter & Gamble - Cape Girardeau, MO
- Project Engineer, Streck - Omaha, NE
- Process Engineer, DuPont Industrial Biosciences - Cedar Rapids, IA
- Process Engineer, Green Plains Renewable Energy - Omaha, NE
- Chemical Engineer, Barr Engineering - Salt Lake City, UT
- Research & Design Engineer, Hexagon - Lincoln, NE
- Process Engineer, Novozymes - Blair, NE
- Environmental Engineer, CDM Smith - Kansas City, MO
- Leadership Development Program, Ardent Mills - Hastings, MN
- Quality Engineer, Eaton Corporation - Cleveland, OH

Internships

- Chemical Engineering Co-op, UTC Aerospace - York, NE
- Chemical Engineering Co-op, ExxonMobil - Houston, TX
- EO&T Materials and Process Engineering Intern, The Boeing Company - Seattle, WA
- Chemical Engineering Intern, Black & Veatch - Leawood, KS
- Maintenance and Reliability Intern, Novozymes - Blair, NE
- Soil Sensor Surveyor, Partners in Pollution Prevention - Lincoln, NE
- Animal Protein Engineer Intern, Cargill - Schuyler, NE
- Production Engineering Intern, Archer Daniels Midland - Fremont, NE
- Process Engineer, Koch Fertilizer - Wichita, KS
- Sales Engineering Intern, Cleaver Brooks - Lincoln, NE

Graduate & Professional Schools

- Doctor of Medicine, University of Nebraska Medical Center - Omaha, NE
- Ph.D., Chemical Engineering, Stanford University - Palo Alto, CA
- Ph.D., Chemical & Biomolecular Engineering, University of Nebraska-Lincoln - Lincoln, NE
- Juris Doctor, University of Nebraska College of Law - Lincoln, NE
- Ph.D., Petroleum Engineering, Texas A&M University - College Station, TX
- Ph.D., Chemical Engineering, University of Pittsburgh - Pittsburgh, PA
- Ph.D., Materials Science, University of California-Santa Barbara - Santa Barbara, CA
- Ph.D., Materials Science, University of Wisconsin - Madison, NE
- Master's in Science Teaching, University of Nebraska-Lincoln - Lincoln, NE
- Master's in Mathematics Education, The City College of New York - New York, NY