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, life-long 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 meet both the University and College of Engineering entrance requirements. The following includes both the University and College of Engineering 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 for Change.

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	Mechanistic Organic Chemistry I and Mechanistic Organic Chemistry I Laboratory	4
CHME 202	Mass and Energy Balances [3]	3
CHME 204	Carbon Footprints: From Greenhouse Gases to Global Warming (ACE 9)	3
ENGR 20	Sophomore Engineering Seminar	0
MATH 208	Calculus III	4
PHYS 212	General Physics II	4
Credit Hours Subtotal:		18
Fourth Semester		
CHEM 262 & CHEM 264A	Mechanistic Organic Chemistry II 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
MATH 221	Differential Equations	3
Credit Hours Subtotal:		16
Fifth Semester		
CHEM 221A & CHEM 221L	Elementary Quantitative Analysis and Elementary Quantitative Analysis Laboratory	5
CHME 312	Chemical Engineering Computation	3
CHME 323	Chemical Engineering Thermodynamics and Kinetics	3
CHME 331	Equilibrium Stage Operations	3
CHME 332	Transport Operations I	3
Credit Hours Subtotal:		17
Sixth Semester		
CHME 330	Chemical Engineering Laboratory I	3
CHME 333	Transport Operations II	3
CHME 334	Transport Operations III	3
Advanced Chemistry		
Select one of the following:		3
CHEM 421	Analytical Chemistry	
CHEM 431 / BIOC 431 / BIOS 431	Biochemistry I: Structure and Metabolism	
CHEM 441	Inorganic Chemistry	
CHEM 481	Physical Chemistry I	
ACE 6 Elective [2]		3
Credit Hours Subtotal:		15
Seventh Semester		
CHME 442	Chemical Reactor Engineering and Design	3
CHME 452	Chemical Engineering Process Economics and Optimization	3
CHME 460	Automatic Process Control Laboratory	1
CHME 462	Automatic Process Control	3
ENGR 400	Professional Ethics and Social Responsibilities	1
ACE 7 Elective [2]		3
CHME Technical Electives		*3*
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
ACE 8 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, and 8.*

[3] *Minimum C- grade required.*

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
  - A minimum of 3 of these credit hours must come from the CHME Technical Electives Courses list
- Students should consult with their academic advisor when selecting technical elective courses
- Students are expected to complete their technical elective requirements during their junior and senior years with corresponding level of courses
- 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.

CHME Technical Elective Courses (minimum of 3 hours)

CHME 315	Energy Science and Engineering	3
CHME 324	Molecular Processes and Applications	3
CHME 408	Product Design and Development	3
CHME 409	Process Intensification and Sustainability	3
CHME 412	Introduction to Atomistic Simulations	3
CHME 447	Principles and Applications of Catalysis in Reaction Engineering	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
CHME 482	Polymers	3
CHME 483	Chemical Processes in Semiconductor Manufacturing	3
CHME 486	Electrochemical Engineering	3
CHME 489	Air Pollution, Assessment and Control	3

Additional Technical Electives

Remaining technical electives may come from these courses:

CHME Senior Problems or Honors Thesis

CHME 499	Senior Problems	1-6
CHME 499H	Honors Thesis	1-6

Biotechnology/Bioengineering/Chemistry Courses

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

Environmental Engineering Courses

BSEN 455 / CIVE 455	Nonpoint Source Pollution Control Engineering	3
CHEM 421	Analytical Chemistry	3
CHEM 423	Analytical Chemistry Laboratory	2
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 Courses

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 / ECEN 422	Introduction to Physics and Chemistry of Solids	3

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 enginering. 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

CHME 202 Mass and Energy Balances
Prerequisites: CHEM 110 or CHEM 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 9 Global/Diversity

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 315 Energy Science and Engineering
Prerequisites: Sophomore and Junior standing in science and engineering
Description: Focuses on energy fundamentals, energy types, energy production, energy conversion, energy storage, energy conservation and coupling. Also discusses clean energy technologies, energy economics, energy management, and sustainability of energy systems. Develops understanding of energy problems and their solutions.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL

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 312 or parallel, 331, 332; CHME 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 or parallel.
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 or parallel, 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 330; 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 331, CHME 333, CHME 334
Description: Analysis of product design and development with the function of the product required by customers. Brainstorming toward creative models and protypes 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

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 331, CHME 333, CHME 334. Credit toward the degree may be earned in only one of BSEN 206/CONE 206 or CHME 452
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 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

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, Parners 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