CHEMICAL ENGINEERING

Description
The mission of the University of Nebraska–Lincoln chemical and biomolecular engineering program 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, generating new knowledge, and providing leadership in their respective industry or field.

Solves engineering and scientific challenges. Graduates will use critical thinking and engineering techniques and strategies to develop economical solutions to technical challenges, within practical constraints and limitations.

Communicates effectively to diverse audiences. Graduates will demonstrate respect for different perspectives and use effective communication skills with broad and diverse audiences.

Acts safely and ethically. Graduates will uphold the American Institute of Chemical Engineers (AIChE) Code of Ethics and will influence others to do the same.

Engages in life-long 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 in common with other students in engineering, 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, to test the theories and correlations developed in the classroom, and to 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 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. 4 units of mathematics: 2 of algebra, 1 of geometry, 1 of precalculus and trigonometry.
2. 4 units of English.
3. 3 units of natural science that must include 1 unit of physics and 1 unit of chemistry (chemistry requirement waived for students in construction management).
4. 2 units of a single foreign language.
5. 3 units of social studies.
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.
7. Students having an ACT score of 19 or less in English (or equivalent SAT score) must take ENGL 150 Writing and Inquiry or ENGL 151 Writing and Argument.

A total of 16 units is required for admission.
Students must have an ACT (enhanced) score of 24 or greater (or equivalent SAT). Students who lack entrance requirements may be admitted based on ACT scores, high school rank and credits, or may be admitted to pre-engineering status in the Exploratory and Pre-Professional Advising Center. Pre-engineering students are advised within the College of Engineering.

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 UNL 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 Exploratory and Pre-Professional Advising Center or other Colleges at UNL.

Students should consult their advisor, their department chair, or Engineering Student Services 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 freshman entrance requirements and have a minimum cumulative GPA of 2.5 for Nebraska residents or 3.0 for non-residents, and be calculus-ready. Students not meeting either of these requirements must enroll in the Explore Center or another UNL college until they meet COE admission requirements.

The COE accepts courses for transfer for which a C or better grade was received. Although UNL accepts D grades from the University of Nebraska at Kearney and at 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.

All transfer students must adopt the curricular requirements of the undergraduate catalog current at the time of transfer to the COE—not that in use when they entered UNL. Upon admission to UNL, students wishing to pursue degree programs in the COE will be classified and subject to the policies defined in the subsequent section.

College Degree Requirements

Grade Rules

Grade Appeals

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

Catalog Rule

Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted at UNL. 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 UNL 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.

Learning Outcomes

Majors in chemical engineering will have:

1. An ability to apply knowledge of mathematics, science, and engineering. (a)
2. An ability to design and conduct experiments, as well as to analyze and interpret data. (b)
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. (c)
4. An ability to function on multidisciplinary teams. (d)
5. An ability to identify, formulate, and solve engineering problems. (e)
6. An understanding of professional and ethical responsibility. (f)
7. An ability to communicate effectively. (g)
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context. (h)
9. A recognition of the need for, and an ability to engage in life-long learning. (i)
10. A knowledge of contemporary issues. (j)
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. (k)

NOTE: Letters are references to ABET Engineering Accreditation Commission outcomes (a through k).

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 113</td>
<td>Fundamental Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHME 113</td>
<td>Introduction to Chemical Engineering I</td>
<td>2</td>
</tr>
<tr>
<td>ENGR 10</td>
<td>Freshman Engineering Seminar</td>
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<tr>
<td>MATH 106</td>
<td>Calculus I</td>
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</table>

Oral Communication Elective

Select one of the following: 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>ENGR 100</td>
<td>Interpersonal Skills for Engineering Leaders</td>
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<tr>
<td>ALEC 102</td>
<td>Interpersonal Skills for Leadership</td>
</tr>
<tr>
<td>JGEN 300</td>
<td>Technical Communication II</td>
</tr>
<tr>
<td>COMM 286</td>
<td>Business and Professional Communication</td>
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<td>(SLO 2)</td>
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</tbody>
</table>

ACE Elective 2 3

Credit Hours Subtotal: 17

Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 114</td>
<td>Fundamental Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHME 114</td>
<td>Introduction to Chemical Engineering II</td>
<td>2</td>
</tr>
<tr>
<td>CSCE 155N</td>
<td>Computer Science I: Engineering and Science Focus</td>
<td>3</td>
</tr>
<tr>
<td>MATH 107</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>General Physics I</td>
<td>4</td>
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</table>

Credit Hours Subtotal: 16

Third Semester

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CHEM 261</td>
<td>Organic Chemistry</td>
<td>3</td>
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<tr>
<td>Course Code</td>
<td>Course Name</td>
<td>Credits</td>
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<tr>
<td>-------------</td>
<td>-----------------------------------------------</td>
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<tr>
<td>CHEM 263A</td>
<td>Organic Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CHME 202</td>
<td>Mass and Energy Balances</td>
<td>3</td>
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<tr>
<td>ENGR 20</td>
<td>Sophomore Engineering Seminar</td>
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<tr>
<td>MATH 208</td>
<td>Calculus III</td>
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<tr>
<td>PHYS 212</td>
<td>General Physics II</td>
<td>4</td>
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<tr>
<td>ACE Elective</td>
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<td><strong>Fourth Semester Credit Hours Subtotal:</strong></td>
<td>18</td>
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<tr>
<td>CHEM 262</td>
<td>Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 264A</td>
<td>Organic Chemistry Laboratory</td>
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</tr>
<tr>
<td>CHME 223</td>
<td>Chemical Engineering Thermodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>ECEN 211</td>
<td>Elements of Electrical Engineering I</td>
<td>3</td>
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<tr>
<td>JGEN 200</td>
<td>Technical Communication I</td>
<td>3</td>
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<tr>
<td>MATH 221</td>
<td>Differential Equations</td>
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<td></td>
<td><strong>Fifth Semester Credit Hours Subtotal:</strong></td>
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<tr>
<td>CHEM 221</td>
<td>Elementary Quantitative Analysis</td>
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</tr>
<tr>
<td>CHME 323</td>
<td>Chemical Engineering Thermodynamics and Kinetics</td>
<td>3</td>
</tr>
<tr>
<td>CHME 331</td>
<td>Equilibrium Stage Operations</td>
<td>3</td>
</tr>
<tr>
<td>CHME 332</td>
<td>Transport Operations I</td>
<td>3</td>
</tr>
<tr>
<td>ACE Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Sixth Semester Credit Hours Subtotal:</strong></td>
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</tr>
<tr>
<td>CHME 312</td>
<td>Chemical Engineering Computation</td>
<td>3</td>
</tr>
<tr>
<td>CHME 330</td>
<td>Chemical Engineering Laboratory I</td>
<td>3</td>
</tr>
<tr>
<td>CHME 333</td>
<td>Transport Operations II</td>
<td>3</td>
</tr>
<tr>
<td>CHME 434</td>
<td>Diffusional Operations</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Advanced Chemistry/Chemical Engineering:</strong></td>
<td></td>
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<tr>
<td></td>
<td>Select one of the following:</td>
<td>3</td>
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<tr>
<td>CHME 324</td>
<td>Molecular Processes and Applications</td>
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<tr>
<td>CHEM 421</td>
<td>Analytical Chemistry</td>
<td></td>
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<tr>
<td>CHEM 431</td>
<td>Structure and Metabolism</td>
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<tr>
<td>CHEM 441</td>
<td>Inorganic Chemistry</td>
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<tr>
<td>CHME 473</td>
<td>Biochemical Engineering</td>
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<td></td>
<td><strong>Seventh Semester Credit Hours Subtotal:</strong></td>
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</tr>
<tr>
<td>CHME 420</td>
<td>Chemical Process Safety</td>
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</tr>
<tr>
<td>CHME 442</td>
<td>Chemical Reactor Engineering and Design</td>
<td>3</td>
</tr>
<tr>
<td>CHME 452</td>
<td>Chemical Engineering Process Economics and Optimization</td>
<td>3</td>
</tr>
<tr>
<td>CHME 462</td>
<td>Automatic Process Control</td>
<td>3</td>
</tr>
<tr>
<td>Technical Electives</td>
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<tr>
<td>ACE Elective</td>
<td></td>
<td>3</td>
</tr>
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<td></td>
<td><strong>Eighth Semester Credit Hours Subtotal:</strong></td>
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<tr>
<td>CHME 430</td>
<td>Chemical Engineering Laboratory II</td>
<td>4</td>
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<tr>
<td>CHME 453</td>
<td>Chemical Engineering Process Design and Safety</td>
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<tr>
<td>CHME 460</td>
<td>Automatic Process Control Laboratory</td>
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<tr>
<td>ENGR 400</td>
<td>Professional Ethics and Social Responsibilities</td>
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<tr>
<td>Technical Elective</td>
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<td>3</td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHME 412</td>
<td>Introduction to Atomistic Simulations</td>
<td>3</td>
</tr>
<tr>
<td>CHME 812</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 431</td>
<td>Structure and Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 831</td>
<td></td>
<td></td>
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<tr>
<td>BIOC 431</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOS 431</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOS 831</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Metabolism and Biological Information
- **CHEM 432 / CHEM 832**
- **BIOC 432 / BIOS 432 / BIOS 832**

### Inorganic Chemistry
- **CHEM 471**

### Physical Chemistry I
- **CHEM 481**

### Physical Chemistry II
- **CHEM 482**

### Advanced Topics in Biophysical Chemistry
- **CHEM 486 / CHEM 886 / BIOS 486 / BIOS 886**

### Bioanalytical Chemistry Laboratory
- **BIOS 486**

### Bioanalytical Chemistry Laboratory
- **BIOS 886**

### Biomanufacturing Laboratory
- **CHME 470**

### Biochemical Engineering
- **CHME 473 / CHME 873**

### Advanced Biochemical Engineering
- **CHME 474 / CHME 874**

### Biochemical Separations
- **CHME 475 / CHME 875**

### Micro/Nano systems for Engineering and Life Sciences
- **CHME 476 / CHME 876**

### Molecular Bioengineering
- **CHME 477 / CHME 877**

### Microbiology
- **BIOS 312**

### General Genetics
- **BIOS 206**

### Human Anatomy
- **BIOS 214**

### Materials Engineering
- **CHME 482 / CHME 882**
- **MATL 360**
- **MATL 460**
- **MATL 462 / MATL 862**
- **MATL 469 / MATL 869**
- **MATL 471 / MATL 871**
- **MATL 473 / MATL 873**
- **MECH 325**
- **MECH 381**
- **PHYS 422 / PHYS 822 / ECEN 422 / ECEN 822**

### Mathematics and Statistics
- **MATH 314 / MATH 814**
- **MATH 322 / MATH 822**
- **MATH 424 / MATH 824**
- **STAT 380 / MATH 380**

### 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 of 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

**Format:** LEC

**CHME 114 Introduction to Chemical Engineering II**

**Prerequisites:** MATH 106 or parallel, CHEM 113 or CHEM 109 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

**Format:** LEC

**Prerequisite for:** CHME 202
CHME 202 Mass and Energy Balances  
Prerequisites: CHEM 113; 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  
Format: LEC  
Prerequisite for: CHME 223; CHME 331

CHME 223 Chemical Engineering Thermodynamics I  
Prerequisites: A grade of C- or better in CHME 202; CSCE 155N or parallel  
Description: Application of the three fundamental laws to chemical engineering problems.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC

CHME 312 Chemical Engineering Computation  
Prerequisites: Junior standing; CSCE 155A, 155E, 155H, 155N, or 155T; MATH 221; or permission.  
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  
Format: LEC

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  
Format: LEC  
Prerequisite for: CHME 324; CHME 847, CHME 447

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  
Format: LEC

CHME 330 Chemical Engineering Laboratory I  
Prerequisites: CHME 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  
Format: LEC

CHME 331 Equilibrium Stage Operations  
Prerequisites: MATH 107; a grade of C- or better in CHME 202; CHME 223, CSCE 155N 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  
Format: LEC  
Prerequisite for: CHME 330

CHME 332 Transport Operations I  
Crosslisted with: CHME 832  
Prerequisites: CHME 332 or parallel  
Description: Mass, momentum and energy transport phenomena and their application in chemical engineering.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  
Prerequisite for: CHME 330

CHME 333 Transport Operations II  
Crosslisted with: CHME 833  
Prerequisites: CHME 332  
Description: Continuation of CHME 332/832.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC  
Prerequisite for: CHME 835

CHME 412 Introduction to Atomistic Simulations  
Crosslisted with: CHME 812  
Prerequisites: Senior standing or permission  
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  
Format: LEC

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  
Format: LEC  
Offered: FALL/SPR

CHME 430 Chemical Engineering Laboratory II  
Crosslisted with: CHME 830  
Prerequisites: CHME 330; CHME 442 or parallel; CHME 462 or parallel. Parallel: CHME 460.  
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  
Format: LAB
CHME 434 Diffusional Operations
Crosslisted with: CHME 834
Prerequisites: CHME 331, MATH 221.
Description: Application of diffusional theory to the design of processing equipment required for absorption, adsorption, leaching, drying, and chemical reactions.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CHME 442 Chemical Reactor Engineering and Design
Crosslisted with: CHME 842
Prerequisites: CHME 323 or permission
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
Format: LEC

CHME 447 Principles and Applications of Catalysis in Reaction Engineering
Crosslisted with: CHME 847
Prerequisites: CHME 323 or permission.
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
Format: LEC

CHME 452 Chemical Engineering Process Economics and Optimization
Crosslisted with: CHME 852
Prerequisites: Senior standing in chemical engineering.
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
Format: LEC

CHME 453 Chemical Engineering Process Design and Safety
Crosslisted with: CHME 853
Prerequisites: CHME 331, 333, 442, 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
Format: LEC

CHME 454 Chemical Process Engineering
Crosslisted with: CHME 854
Prerequisites: CHME 430 and 312 or permission.
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
Format: LEC

CHME 460 Automatic Process Control Laboratory
Crosslisted with: CHME 860
Prerequisites: CHME 462 or parallel. Parallel: CHME 430.
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
Format: LAB

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
Format: LEC

CHME 470 Biomanufacturing Laboratory
Prerequisites: CHME 473 or permission
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
Format: LEC

CHME 473 Biochemical Engineering
Crosslisted with: CHME 873
Prerequisites: CHEM 262, CHEM 431
Description: Dynamics of microbial growth and death. Engineering processes for microbiological synthesis of cellular materials and industrial products, with emphasis on food and pharmaceutical production by bacteria and fungi.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CHME 477 Biotechnology Laboratory
Prerequisites: CHME 462 or CHME 430
Description: Selected experiments in molecular biology, bioprocess development, fermentation, purification, and analytical methods as they pertain to biotechnology.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LAB

CHME 490 Internship in Chemical Engineering
Prerequisites: Senior standing in chemical engineering.
Description: Internship in chemical engineering laboratories, industry, government, or research facilities.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CHME 495 Independent Study
Prerequisites: Permission of instructor.
Description: Independent study in an area not covered by regular courses.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CHME 499 Thesis
Prerequisites: Permission of instructor.
Description: Original research in chemical engineering.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

ACE: ACE 10 Integrated Product
CHME 474 Advanced Biochemical Engineering
Crosslisted with: CHME 874
Prerequisites: CHME 473/873 or permission.
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
Format: LEC

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
Format: LEC

CHME 476 Micro/Nano systems for Engineering and Life Sciences
Crosslisted with: CHME 876
Prerequisites: Senior standing or permission
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
Format: LEC

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
Format: LEC

CHME 482 Polymers
Crosslisted with: CHME 882
Prerequisites: CHEM 262 and 264.
Description: Introduction to polymer technology stressing polymerization kinetics, methods of resin manufacture and applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CHME 486 Electrochemical Engineering
Crosslisted with: CHME 886
Prerequisites: CHME 333, and 442, or MECH 310 and MATL 360, or permission.
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
Format: LEC

CHME 489 Air Pollution, Assessment and Control
Crosslisted with: CHME 889
Prerequisites: Senior standing or permission
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
Format: LEC

CHME 496 Advanced Topics in Chemical Engineering Computation
Crosslisted with: CHME 896
Prerequisites: CHME 312 or CSCE 455/855 or ENGM 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
Format: LEC

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
Format: IND

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
Format: IND
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.

**17 HR TERM 1**

**ACE 4 Chem Sequence A**
complete CHEM 113

CHEM 113 is not a critical course, but must be taken in sequence with CHEM 114, which is a critical course.

**Intro to Chemical Engr**
complete CHME 113

Complete CHME 113. This course is not critical but should be taken in sequence with CHME 114 which is a critical course.

**Freshman Eng Seminar**
complete ENGR 10#

ENGR 10 becomes critical to your success in the major if not completed by the end of the first term of enrollment.

**Calculus I And II ACE 3**
complete MATH 106

Calculus III/Physics
complete PHYS 211

**18 HR TERM 2**

**Intro to Chemical Engr**
complete CHME 114

CHME 114 becomes critical to your success in the major if not completed by the end of the second term of enrollment.

**ACE 4 Chem Sequence A**
complete CHEM 114

CHEM 114 becomes critical to your success in the major if not completed by the end of the third term of enrollment.

**Comp Skills Thermodynamic**
complete CSCE 155N

CSCE 155N becomes critical to your success in the major if not completed by the end of the fourth term of enrollment.

**Calculus I And II ACE 3**
complete MATH 107

**18 HR TERM 3**

**Organic Chemistry**
complete CHEM 261, CHEM 263A

CHEM 261 and 263A become critical to your success in the major if not completed by the end of the fifth term of enrollment.

**Mass And Energy Balances**
complete CHME 202

Complete an ACE 5, 6, 7, 8, or 9 requirement this term.
CHME 202 becomes critical to your success in the major if not completed by the end of the third term of enrollment.

Engr Seminar/Prof Ethics
complete ENGR20#

Calculus III/Physics
complete MATH 208, PHYS 212

ACE 6 Social Sciences
complete 1 from ACE6

Complete an ACE 5, 6, 7, 8, or 9 requirement this term.

16 HR TERM 4

Organic Chemistry
complete CHEM 262, CHEM 264A

CHEM 262 and 264A become critical to your success in the major if not completed by the end of the sixth term of enrollment.

Comp Skills Thermodynamic
complete CHME 223

CHME 223 becomes critical to your success in the major if not completed by the end of the fourth term of enrollment.

Chemical Engineering
complete ECEN 211

ACE 1 Written
complete JGEN 200

Diff Equations
complete MATH 221

MATH 221 becomes critical to your success in the major if not completed by the end of the sixth term of enrollment.

Milestones
1. Professional Admission into College.

18 HR TERM 5

ACE 4 Chem Sequence A
complete CHEM 221

CHEM 221 is not a critical course, but must be taken in sequence with CHEM 114, which is a critical course.

CHME 3rd Year
complete CHME 323

CHME 323 becomes critical to your success in the major if not completed by the end of the sixth term of enrollment.

ACE 7 Arts
complete 1 from ACE7

Complete an ACE 5, 6, 7, 8, or 9 requirement this term.

15 HR TERM 6

Adv Chemistry Up Lvl
complete 1 from CHME 324, CHEM 421, CHEM 431, CHEM 441

Chemical Engineering
complete CHME 333, CHME 434

CHME 333 and 434 become critical to your success in the major if not completed by the end of the sixth term of enrollment.
CHME 4th Year

complete CHME 330

CHME 330 becomes critical to your success in the major if not completed by the end of the seventh term of enrollment.

**18 HR TERM 7**

Chemical Engineering

complete CHME 442

CHME 452 and 462 become critical to your success in the major if not completed by the end of the seventh term of enrollment.

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CHME Technical Electives

recommend 1 or more courses

See advisor for list.

**ACE 9 Global/Human Divers**

complete 1 from ACE9

Complete an ACE 5, 6, 7, 8, or 9 requirement this term.

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Graduation Requirements

1. 131 hours required for graduation.
2. 2.40 GPA required for graduation.
3. 30 of the last 36 hours must be taken at UNL/UNO.

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**Career Information**

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

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**Jobs of Recent Graduates**

- Process Engineer, ExxonMobil - Beaumont TX
- Leadership Development Program, Ardent Mills - Hastings MN
- Optimized Operations Engineer, 3M - Nevada MO
- Project Engineer, Cargill - Blair NE
- Lab Technician, Lincoln Industries - Lincoln NE
- Chemical Engineer I, Black Veatch - Kansas City KS
- Chemical Process Engineer, Archer Daniels Midland - Columbus NE
- Process Engineer, Green Plains Renewable Energy - Omaha NE
- Assistant Chemical Engineer, Burns and McDonnell - Kansas City MO
- Process Engineer I, Garmin - Olathe KS

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**Internships**

- CHME Co-op, UTC Aerospace - York NE
- CHME Co-op, ExxonMobil - Houston TX
- EOT 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

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**Grad Schools**

- Doctor of Medicine, University of Nebraska Medical Center - Omaha NE
- Ph.D. Chemical Engineering, Stanford University - Palo Alto CA
- Chemical Biomolecular Engineering, Ph.D., University of Nebraska-Lincoln - Lincoln NE
- Juris Doctor, University of Nebraska-Lincoln College of Law - Lincoln NE
- Petroleum Engineering, Ph.D., Texas AM University - College Station TX
• Chemical Engineering, Ph.D., University of Pittsburgh - Pittsburgh PA
• Materials Science, Ph.D., University of California-Santa Barbara - Santa Barbara CA
• Materials Science, Ph.D., University of Wisconsin - Madison NE