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, 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 like other engineering students, but in addition receive extensive training in sciences and engineering design methods to prepare them for successful professional careers and to contribute to the needs of society.

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. 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 (CHEM 102H is acceptable)
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.
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 Exploratory and Pre-Professional Advising Center.

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

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 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 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 the University of Nebraska–Lincoln. Upon
admission to Nebraska, students wishing to pursue degree programs in the COE will be classified and subject to the policies defined in the
subsequent section.

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

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 113A</td>
<td>Fundamental Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 113L</td>
<td>and Fundamental Chemistry I Laboratory</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>
<td>0</td>
</tr>
<tr>
<td>MATH 106</td>
<td>Calculus I</td>
<td>5</td>
</tr>
</tbody>
</table>

Oral Communication Elective
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 Elective

Credit Hours Subtotal: 17

Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>JGEN 300</td>
<td>Technical Communication II</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 200</td>
<td>Interpersonal Skills for Engineering Leaders</td>
<td>3</td>
</tr>
<tr>
<td>&amp; CHEM 211</td>
<td>and Fundamental Chemistry II Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>MATH 106</td>
<td>Calculus II</td>
<td>3</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 17
Chemical Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</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>
</tr>
<tr>
<td></td>
<td><strong>Credit Hours Subtotal:</strong></td>
<td><strong>16</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Third Semester</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 261</td>
<td>Organic Chemistry</td>
<td>3</td>
</tr>
<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>
</tr>
<tr>
<td>ENGR 20</td>
<td>Sophomore Engineering Seminar</td>
<td>0</td>
</tr>
<tr>
<td>MATH 208</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>General Physics II</td>
<td>4</td>
</tr>
<tr>
<td>ACE Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Credit Hours Subtotal:</strong></td>
<td><strong>18</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Fourth Semester</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 262</td>
<td>Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 264A</td>
<td>Organic Chemistry Laboratory</td>
<td>1</td>
</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>
</tr>
<tr>
<td>JGEN 200</td>
<td>Technical Communication I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 221</td>
<td>Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Credit Hours Subtotal:</strong></td>
<td><strong>16</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Fifth Semester</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 221</td>
<td>Elementary Quantitative Analysis</td>
<td>4</td>
</tr>
<tr>
<td>CHME 312</td>
<td>Chemical Engineering Computation</td>
<td>3</td>
</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></td>
<td><strong>Credit Hours Subtotal:</strong></td>
<td><strong>16</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Sixth Semester</strong></td>
<td></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>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHME 324</td>
<td>Molecular Processes and Applications</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 421</td>
<td>Analytical Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHEM 431 /</td>
<td>Biochemistry I: Structure and Metabolism</td>
<td></td>
</tr>
<tr>
<td>BIOC 431 /</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOS 431</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHME 441</td>
<td>Inorganic Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHME 473</td>
<td>Biochemical Engineering</td>
<td></td>
</tr>
<tr>
<td>ACE Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Credit Hours Subtotal:</strong></td>
<td><strong>15</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Seventh Semester</strong></td>
<td></td>
</tr>
<tr>
<td>CHME 420</td>
<td>Chemical Process Safety</td>
<td>3</td>
</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</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Optimization</td>
<td></td>
</tr>
<tr>
<td>ENGR 400</td>
<td>Professional Ethics and Social Responsibilities</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Technical Electives</td>
<td>3</td>
</tr>
<tr>
<td>ACE Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Credit Hours Subtotal:</strong></td>
<td><strong>17</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Eighth Semester</strong></td>
<td></td>
</tr>
<tr>
<td>CHME 430</td>
<td>Chemical Engineering Laboratory II</td>
<td>4</td>
</tr>
<tr>
<td>CHME 453</td>
<td>Chemical Engineering Process Design and Safety</td>
<td>3</td>
</tr>
<tr>
<td>CHME 460</td>
<td>Automatic Process Control Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CHME 462</td>
<td>Automatic Process Control</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Technical Elective</td>
<td>3</td>
</tr>
<tr>
<td>ACE Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Credit Hours Subtotal:</strong></td>
<td><strong>16</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total Credit Hours</strong></td>
<td><strong>131</strong></td>
</tr>
</tbody>
</table>

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

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

### Environmental Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSEN 455 /</td>
<td>CIVE 455</td>
<td>Nonpoint Source Pollution Control</td>
</tr>
<tr>
<td>CHEM 421</td>
<td>Analytical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 423</td>
<td>Analytical Chemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHME 489</td>
<td>Air Pollution, Assessment and Control</td>
<td>3</td>
</tr>
<tr>
<td>CIVE 321 /</td>
<td>BSEN 321</td>
<td>Principles to Environmental Engineering</td>
</tr>
<tr>
<td>CIVE 321L /</td>
<td>BSEN 321L</td>
<td>Environmental Engineering Laboratory</td>
</tr>
<tr>
<td>CIVE 422 /</td>
<td>BSEN 422</td>
<td>Pollution Prevention: Principles and Practices</td>
</tr>
<tr>
<td>CIVE 424</td>
<td>Solid Waste Management Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENV 490</td>
<td>Environmental Studies Seminar</td>
<td>1</td>
</tr>
</tbody>
</table>

### Mathematics and Statistics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 314</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 424</td>
<td>Introduction to Partial Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>STAT 380</td>
<td>Statistics and Applications</td>
<td>3</td>
</tr>
</tbody>
</table>

### 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 113 or CHEM 113A and 113L or CHEM 109 or CHEM 109A and 109L or parallel

*Description:* Analytical and computational methods for solving problems related to chemical process measurement, 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 113 or CHEM 113A and 113L, 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 223

### Materials Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHME 482</td>
<td>Polymers</td>
<td>3</td>
</tr>
<tr>
<td>MATL 360</td>
<td>Elements of Materials Science</td>
<td>4</td>
</tr>
<tr>
<td>MATL 460</td>
<td>Mechanical Aspects of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MATL 462</td>
<td>X-ray Diffraction</td>
<td>3</td>
</tr>
<tr>
<td>MATL 469</td>
<td>Physical Materials Systems</td>
<td>3</td>
</tr>
<tr>
<td>MATL 471</td>
<td>Electron Microscopy of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MATL 473</td>
<td>Corrosion</td>
<td>3</td>
</tr>
<tr>
<td>MECH 325</td>
<td>Mechanics of Elastic Bodies</td>
<td>3</td>
</tr>
</tbody>
</table>
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 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 312 Chemical Engineering Computation
Prerequisites: MATH 221, CSCE 155N
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 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 330

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

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 332 Transport Operations I
Crosslisted with: CHME 832
Prerequisites: MATH 208; CHME 223
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
Grading Option: Graded with Option
Prerequisite for: AGEN 325, BSEN 325; AGEN 344, BSEN 344; CHME 330; CHME 333, CHME 833; CHME 420; CHME 835; CIVE 420; ENVE 410

CHME 333 Transport Operations II
Crosslisted with: CHME 833
Prerequisites: CHME 312, CHME 332
Description: Continuation of CHME 332/832.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: CHME 475, CHME 875; CHME 815; CHME 835, CHME 935; CHME 995

CHME 371 Stem Cell Engineering and Regenerative Medicine
Crosslisted with: CHME 871
Prerequisites: CHEM 109 or CHEM 109A and 109L or CHEM 113 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 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

CHME 434 Diffusional Operations
Crosslisted with: CHME 834
Prerequisites: CHME 332
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
Grading Option: Graded with Option

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

CHME 454 Chemical Process Engineering
Crosslisted with: CHME 854
Prerequisites: CHME 430 and 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

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: 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
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 333, and CHME 442, or MECH 310 and MATL 360.
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 Crop Protections LLC - Baton Rouge LA
- Process Engineer, Vishay Intertecntologies - 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 - 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
- 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 A&M 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
- Science Teaching, M.A., University of Nebraska-Lincoln - Lincoln NE