CHEMICAL ENGINEERING: BIOMOLECULAR ENGINEERING, BS

for the degree of Bachelor of Science in Chemical Engineering, Biomolecular Engineering Concentration (Specialized Curriculum)

department website: https://chbe.illinois.edu/
department faculty: Chemical & Biomolecular Engineering Faculty (https://chbe.illinois.edu/directory/)
advising: SCS Academic Advising (https://scs.illinois.edu/academics/advising/)
overview of college admissions & requirements: Liberal Arts & Sciences (http://catalog.illinois.edu/schools/las/academic-units/)
college website: https://las.illinois.edu/

The first two years of the Chemical Engineering curriculum provide a strong foundation in basic sciences through Physics, Mathematics, Chemistry, an introduction to what Chemical Engineers do, and the fundamental basis of Chemical Engineering (Mass and Energy Balances and Thermodynamics.) The Senior year incorporates all of this learning through high level technical electives, Process Control, Capstone Lab, and Capstone Design courses. It is through the lab and design class that students apply everything they have learned in previous Chemical Engineering courses to real-world team projects and presentations.

The Chemical Engineering specialized curriculum provides two areas of concentration: Chemical Engineering and Biomolecular Engineering. Each area is based on a strong fundamental understanding of Chemical Engineering, however the Biomolecular concentration’s technical electives focus more on bio-applied processing and technology.

Areas of Concentration

• Chemical Engineering (http://catalog.illinois.edu/undergraduate/las/chemical-engineering-bs/#degreerequirements): The chemical engineering concentration is designed to prepare students for careers in the energy, chemical, food, energy, pharmaceutical, semiconductor processing, personal care, fiber and materials industries.

• Biomolecular Engineering (p. 1): The Biomolecular Engineering concentration builds upon the traditional principles of chemical engineering, but specializes in biological and biotechnological systems in order to better prepare students who are interested in or seek employment in the food, pharmaceutical, and biotechnology industries.

for the degree of Bachelor of Science in Chemical Engineering, Biomolecular Engineering Concentration (Specialized Curriculum)

General education: Students must complete the Campus General Education (https://courses.illinois.edu/gened/DEFAULT/DEFAULT/) requirements including the campus general education language requirement.

Minimum required major and supporting course work: A grade point average of 2.5 or higher in all courses required for the major earned on the UIUC campus is required in order to be accepted by the department as juniors and seniors.

Minimum hours required for graduation: The curriculum requires 129 hours for graduation and is organized as shown below.

Orientation and Professional Development
These courses introduce opportunities and resources the college, department, and curriculum offers students. They also provide background on the Chemical Engineering curriculum, what chemical engineers do, and the skills to work effectively and successfully in the engineering profession.

Foundational Mathematics and Science
These courses stress the basic mathematical and scientific principles upon which the engineering discipline is based.

Chemical and Biomolecular Engineering Technical Core
These courses stress fundamental concepts and basic laboratory techniques that comprise the common intellectual understanding of chemical engineering and chemical science.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHBE 221</td>
<td>Principles of CHE</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 321</td>
<td>Thermodynamics</td>
<td>4</td>
</tr>
<tr>
<td>CHBE 421</td>
<td>Momentum and Heat Transfer</td>
<td>4</td>
</tr>
<tr>
<td>CHBE 422</td>
<td>Mass Transfer Operations</td>
<td>4</td>
</tr>
<tr>
<td>CHBE 424</td>
<td>Chemical Reaction Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 430</td>
<td>Unit Operations Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>CHBE 431</td>
<td>Process Design</td>
<td>4</td>
</tr>
<tr>
<td>CHBE 440</td>
<td>Process Control and Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 236</td>
<td>Fundamental Organic Chem I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 237</td>
<td>Structure and Synthesis</td>
<td>2</td>
</tr>
</tbody>
</table>
CHEM 315  Instrumental Chem Systems Lab  2
CHEM 420  Instrumental Characterization  2
CHEM 442  Physical Chemistry I  4
CS 101  Intro Computing: Engrg & Sci  3
IE 300  Analysis of Data  3

Total Hours  49

For Biomolecular Engineering

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Technical Core</td>
<td>49</td>
</tr>
<tr>
<td>MCB 450</td>
<td>Introductory Biochemistry</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Hours  52

Technical Electives

These courses stress the rigorous analysis and design principles practiced in the major subdisciplines of chemical engineering embodied in the chemical engineering and biomolecular engineering concentrations.

For Biomolecular Engineering

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Selected from the departmentally approved List of Approved Biomolecular Engineering Technical Electives Categories A and B, satisfying these distribution requirements:</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Any courses from Category A 7, 8</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Any courses from Category B 8</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Any 400-level course from List 8</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Hours  19

Social Sciences and Humanities

The social sciences and humanities courses ensure that students have exposure in breadth and depth to areas of intellectual activity that are essential to the general education of any college graduate.

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>General education courses to satisfy the university requirements for social &amp; behavioral sciences, humanities &amp; the arts, and cultural studies (Non-Western, U.S. Minority, and Western Cultures).</td>
<td>16</td>
</tr>
</tbody>
</table>

Composition

These courses teach fundamentals of expository writing.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHET 105</td>
<td>Writing and Research</td>
<td>4</td>
</tr>
</tbody>
</table>

Advanced Composition (satisfied by completing the sequence CHBE 430 and CHBE 431 in the Chemical Engineering Technical Core).

Total Hours  4

1 For students entering the curriculum after the freshman year, 1 additional hour of credit from the list of approved engineering technical electives may be substituted in place of CHBE 121.
2 Students who do not place into CHEM 202, or who do not satisfy the mathematics prerequisite for CHEM 202, may substitute the sequence CHEM 102, CHEM 103, CHEM 104, CHEM 105, CHEM 222, and CHEM 223 for CHEM 202, CHEM 203, CHEM 204, and CHEM 205.

MATH 220 may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students without background in calculus.

MATH 441 may be substituted for MATH 285. MATH 286 (4 hours) may be substituted for MATH 285 (3 hours).

Students must register in one of the Chemical Engineering-specific CHEM 315 lab sections.


A maximum of 3 hours from this Category may be undergraduate research credit.

A maximum of 9 total hours of undergraduate research may be counted toward Technical Elective credit.

for the degree of Bachelor of Science Major in Chemical Engineering, Biomolecular Engineering Concentration

The schedule that follows is illustrative, showing the typical sequence in which courses would be taken by a student with no college course credit already earned and who intends to graduate in four years. Each individual’s case may vary, but the position of required named courses is generally indicative of the order in which they should be taken. The first three semesters of the Suggested Sequence is the same for all chemical engineering students. The fifth through eights semesters vary with the area of concentration chosen. Refer to the appropriate sequence continuation below.

First Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Semester</td>
<td></td>
</tr>
<tr>
<td>CHEM 202 1Accelerated Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 203 Accelerated Chemistry Lab I</td>
<td>2</td>
</tr>
<tr>
<td>ENG 100² Engineering Orientation</td>
<td>0</td>
</tr>
<tr>
<td>MATH 221³Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>RHET 105 Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>Elective in Social Sciences or Humanities 4,5</td>
<td>3</td>
</tr>
</tbody>
</table>

Semester Hours  16

Second Semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHBE 121³CHBE Profession</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CHEM 204 Accelerated Chemistry II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHEM 205 Accelerated Chemistry Lab II</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CS 101  Intro Computing: Engrg Sci</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MATH 231 Calculus II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>PHYS 211⁶University Physics: Mechanics</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Semester Hours  16

Second Year

<table>
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<tr>
<th>Semester</th>
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<tr>
<td>CHEM 237 Structure and Synthesis</td>
<td>2</td>
</tr>
<tr>
<td>MATH 241 Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212⁶University Physics: Elec Mag</td>
<td>4</td>
</tr>
</tbody>
</table>

Semester Hours  17

Total Hours:  49

Information listed in this catalog is current as of 12/2020
Major in Chemical Engineering
For the Concentration in Biomolecular Engineering, see below (p. 3)

Second Year

First Semester

Second Year First Semester course information is above in the Suggested Sequence that is common for all students

Semester Hours: 17

Second Semester

CHBE 321 Thermodynamics 4
CHEM 436 Fundamental Organic Chem II or MCB 450 3
MATH 285 Intro Differential Equations 3
MATH 415 Applied Linear Algebra 3
PHYS 214 Univ Physics: Quantum Physics 2
Elective in Social Sciences or Humanities or Technical Elective 4,5,8a 3

Semester Hours: 18

Third Year

First Semester

CHBE 421 Momentum and Heat Transfer 4
CHEM 315 Instrumental Chem Systems Lab 2
CHEM 420 Instrumental Characterization 2
CHEM 442 Physical Chemistry I 4
Elective in Social Sciences or Humanities or Technical Elective 4,5,8a 3

Semester Hours: 15

Second Semester

CHBE 422 Mass Transfer Operations 4
CHBE 424 Chemical Reaction Engineering 3
IE 300 Analysis of Data 3
Elective in Social Sciences or Humanities or Technical Elective 4,5,8a 7

Semester Hours: 17

Fourth Year

First Semester

CHBE 430 Operations Laboratory 4
CHBE 440 Process Control and Dynamics 3
Elective in Social Sciences or Humanities or Technical Elective 4,5,8a 9

Semester Hours: 16

Second Semester

CHBE 431 Process Design 4
Elective in Social Sciences or Humanities or Technical Elective 4,5,8a 10

Semester Hours: 14

Total Hours: 97

1 Students who do not place into CHEM 202, or who do not satisfy the mathematics prerequisite for CHEM 202, may substitute the sequence CHEM 102, CHEM 103, CHEM 104, CHEM 105, CHEM 222, and CHEM 223 for CHEM 202, CHEM 203, CHEM 204, and CHEM 205.

Concentration in Biomolecular Engineering

Second Year

First Semester

Second Year First Semester course information is above in the Suggested Sequence that is common for all students

Semester Hours: 17

Second Semester

CHBE 321 Thermodynamics 4
MCB 450 Introductory Biochemistry 3
MATH 285 Intro Differential Equations 3
MATH 415 Applied Linear Algebra 3
PHYS 214 Univ Physics: Quantum Physics 2
Elective in Social Sciences or Humanities or Technical Elective 4,5,8a 3

Semester Hours: 18

Third Year

First Semester

CHBE 421 Momentum and Heat Transfer 4
CHEM 315 Instrumental Chem Systems Lab 2
CHEM 420 Instrumental Characterization 2
CHEM 442 Physical Chemistry I 4
Elective in Social Sciences or Humanities or Technical Elective 4,5,8a 3

Semester Hours: 15

Second Semester

CHBE 422 Mass Transfer Operations 4
CHBE 424 Chemical Reaction Engineering 3
IE 300 Analysis of Data 3
Elective in Social Sciences or Humanities or Technical Elective 4,5,8a 7

Semester Hours: 17

Fourth Year

First Semester

CHBE 430 Operations Laboratory 4
CHBE 440 Process Control and Dynamics 3
Elective in Social Sciences or Humanities or Technical Elective 4,5,8a 9

Semester Hours: 16

Second Semester

CHBE 431 Process Design 4
Elective in Social Sciences or Humanities or Technical Elective 4,5,8a 10

Semester Hours: 14

Total Hours: 97

Information listed in this catalog is current as of 12/2020
For students entering the curriculum after the freshman year, 1 additional hr of credit from the list of approved engineering technical electives (List 1) may be substituted in place of CHBE 121. The ENG 100 requirement will be waived. Under no circumstances will these requirements be waived for students who are in the chemical engineering curriculum during their freshman year.

MATH 220 may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

At least 16 hours must be taken. All Campus General Education requirements must be satisfied, including those in approved course work in the Humanities/Arts, Social/Behavioral Sciences, and Cultural Studies, including the Western, Non-Western and/or U.S. Minorities components. The requirements for the Campus General Education categories Natural Sciences/Technology, Quantitative Reasoning I and II, Composition I, and Advanced Composition are fulfilled through required course work in the curriculum.

Three semesters of college credit in one foreign language is required. Three years of high school credit in one foreign language are equivalent to three semesters of college credit and satisfy the requirement.

Under no circumstances will PHYS 101-PHYS 102 be accepted as a substitute for any part of the Physics sequence.

MATH 441 may be substituted for MATH 285. MATH 286 may be substituted for MATH 285.

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At least 19 hours must be selected from the departmentally approved List of Approved Chemical Engineering Technical Electives (http://chbe.illinois.edu/wp-content/uploads/2015/11/Technical.Electives.Current.pdf), satisfying these distribution requirements:

a) 6 hours must be 400-level ChBE courses, with not more than 3 hours being CHBE 497 or 499.

b) 3 hours any 400-level course from List 1.

c) 6 hours any courses from List 1.

d) 4 hours any 400-level courses from List 2.

A maximum of 10 total hours of undergraduate research may be counted toward Technical Elective credit. The List of Approved Chemical Engineering Technical Electives may be obtained in 99 RAL or from the department Web site. (http://chbe.illinois.edu/undergraduate/explore-chbe-at-illinois/curriculum-academic-advising/)

At least 19 hours must be selected from the departmentally approved List of Approved Biomolecular Engineering Technical Electives Categories (http://chbe.illinois.edu/wp-content/uploads/2015/11/Technical.Electives.Current.pdf), satisfying these distribution requirements:

a) 9 hours must be from Category A

b) 6 hours must be from Category B

c) 4 hours must be 400-level courses from List 2.

A maximum of 3 hours from Category A may be undergraduate research credit. A maximum of 9 total hours of undergraduate research may be counted toward Technical Elective credit. The List of Approved Biomolecular Engineering Technical Electives may be obtained in Room 99 RAL or from the department Web site. (http://chbe.illinois.edu/undergraduate/explore-chbe-at-illinois/curriculum-academic-advising/)

Students must register in one of the Chemical Engineering-specific CHEM 315 lab sections.

Enrollment in CHBE 430 is limited. Thus CHBE 430 may need to be taken in the second semester and CHBE 431 and/or additional electives taken in the first semester instead. Students in their final semester will have priority for getting into CHBE 430 and CHBE 431.

The sequence CHBE 430 and CHBE 431 satisfies the General Education Advanced Composition requirement.

Information listed in this catalog is current as of 12/2020