CHEMICAL ENGINEERING, CO-OP OPTION, BS

Bachelor of Science in Chemical Engineering with Co-op (420005BS)

This option of the undergraduate program in Chemical Engineering includes a cooperative education component.

The Chemical Engineering program helps students develop intellectual capacity and the ability to apply the principles of transport phenomena, thermodynamics, and chemical reaction kinetics to the creative resolution of technological problems.

All engineers are trained in the application of mechanics, materials, economics, systems, and controls. Chemical engineers, however, apply chemical principles to design, evaluate, build, and operate systems capable of converting inexpensive raw materials into marketable products via chemical reactions, biological processes, and physical separations.

Graduates of the Chemical Engineering program find career opportunities in the chemical process industries, usually involving polymer production, petroleum refining, environmental remediation, materials research and development, process design and development, and process operations and control. In addition, chemical engineers are increasingly in demand in areas such as biotechnology, food production, and solids processing. Critical thinking skills developed throughout the curriculum enable chemical engineers to succeed in other fields including medicine, patent law, and international business.

The Chemical Engineering program maintains a balance between theory and practice to prepare students for careers in a highly technical global society. The curriculum stresses the integration of mathematics, science, and chemical engineering fundamentals throughout the program. At each level of the program, from freshman through seniors, students have the opportunity to gain experience in a wide range of emerging technologies through laboratory courses and design or research electives. Exciting work is performed in biocompatible polymeric materials, biological cellular and enzymatic processes, nanocomposite materials, chemical sensing, computational molecular science, microscale separations, green chemistry, and novel catalytic reactions. Students are also encouraged to gain important practical experience through the optional cooperative education program.

The Chemical Engineering program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org (http://www.abet.org/). The program educational objectives (PEOs) for the Chemical Engineering program are that, within a few years after graduation, our Chemical Engineering graduates:

- apply their technical proficiency to make positive contributions as chemical engineers or any other career path they choose.
- continue life-long learning through professional activities and training, the pursuit of higher educational degrees, and individual professional improvement.
- will contribute to the professional practice of their chosen field through effective communication, leadership, teamwork and service, while exhibiting high ethical and professional standards.

The Chemical Engineering program has specified these student outcomes to be achieved by the time of graduation:

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 Chemical Engineering program also meets the curriculum requirements specified by the American Institute of Chemical Engineers, which are that the curriculum must provide a thorough grounding in the basic sciences including chemistry, physics, and/or biology, with some content at an advanced level, as appropriate to the objectives of the program. The curriculum must include the engineering application of these basic sciences to the design, analysis, and control of chemical, physical, and/or biological processes, including the hazards associated with these processes.

The following information has official approval of the Department of Chemical, Biomolecular, and Corrosion Engineering and The College of Engineering and Polymer Science, but is intended only as a supplemental guide. Official degree requirements are established at the time of transfer and admission to the degree-granting college. Students should refer to the Degree Progress Report (DPR) which is definitive for graduation requirements. Completion of this degree within the identified time frame below is contingent upon many factors, including but not limited to: class availability, total number of required credits, work schedule, finances, family, course drops/withdrawals, successfully passing courses, prerequisites, among others. The transfer process is completed through an appointment with your academic advisor.

Requirements Summary

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>General Education Requirements (<a href="https://bulletin.uakron.edu/undergraduate/general-education/">https://bulletin.uakron.edu/undergraduate/general-education/</a>)</td>
<td>29</td>
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<tr>
<td>Natural Science</td>
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<td>Advanced Chemistry</td>
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<td>Engineering Core</td>
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<td>Chemical Engineering</td>
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Several courses required for the major also satisfy General Education requirements. The University minimum of 34 credits are required for General Education and credit for these courses will apply to both.

General Education Courses

Academic Foundations
- Mathematics, Statistics and Logic: 3 credit hours
- Speaking: 3 credit hours
- Writing: 6 credit hours

Breadth of Knowledge
- Arts/Humanities: 9 credit hours
- Natural Sciences: 7 credit hours
- Social Sciences: 6 credit hours

Diversity
- Domestic Diversity
- Global Diversity

Integrated and Applied Learning
- Select one class from one of the following subcategories:
  - Complex Issues Facing Society
  - Capstone
- Review the General Education Requirements page for detailed course listings.

Total Hours: 34

Natural Science

Electives

Advanced Chemistry

Recommended Sequence

1st Year

Fall Semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>3150:151</td>
<td>Principles of Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>3150:152</td>
<td>Principles of Chemistry I Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>3150:153</td>
<td>Principles of Chemistry II</td>
<td>3</td>
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<tr>
<td>3150:154</td>
<td>Qualitative Analysis</td>
<td>2</td>
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<td>3450:xxx</td>
<td>Advanced Math Elective</td>
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<td>3450:221</td>
<td>Analytic Geometry-Calculus I</td>
<td>4</td>
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<td>3450:222</td>
<td>Analytic Geometry-Calculus II</td>
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<td>3450:223</td>
<td>Analytic Geometry-Calculus III</td>
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<tr>
<td>3450:335</td>
<td>Introduction to Ordinary Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>3650:291</td>
<td>Elementary Classical Physics I</td>
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<tr>
<td>3650:292</td>
<td>Elementary Classical Physics II</td>
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Electives

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<tr>
<td>3150:263</td>
<td>Organic Chemistry Lecture I</td>
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<tr>
<td>3150:264</td>
<td>Organic Chemistry Lecture II</td>
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<td>3150:265</td>
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Recommended Sequence

1st Year

Fall Semester

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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>3150:151</td>
<td>Principles of Chemistry I</td>
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</tr>
<tr>
<td>3150:152</td>
<td>Principles of Chemistry I Laboratory</td>
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<tr>
<td>3300:111</td>
<td>English Composition I</td>
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<tr>
<td>3450:221</td>
<td>Analytic Geometry-Calculus I</td>
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<tr>
<td>4200:101</td>
<td>Tools for Chemical Engineering</td>
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<tr>
<td>4200:110</td>
<td>Project Management and Teamwork I</td>
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Spring Semester

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<tbody>
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<td>3150:153</td>
<td>Principles of Chemistry II</td>
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Total Hours: 42
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<tr>
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<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>3150:154</td>
<td>Qualitative Analysis</td>
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<tr>
<td>3450:222</td>
<td>Analytic Geometry-Calculus II (^1)</td>
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<td>4200:121</td>
<td>Chemical Engineering Computations</td>
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<td></td>
<td>Second Writing Course (^1,3)</td>
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<td></td>
<td>General Education or Honor Distribution (^4)</td>
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<td>Hours</td>
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### 2nd Year

#### Fall Semester
- 3150:263 Organic Chemistry Lecture I  3
- 3150:265 Organic Chemistry Laboratory I  2
- 3450:223 Analytic Geometry-Calculus III \(^1\)  4
- 3650:291 Elementary Classical Physics I \(^1\)  4
- 4200:200 Material & Energy Balances  4
- 4200:210 Project Management and Teamwork II  1

#### Hours
- 18

#### Spring Semester
- 3150:264 Organic Chemistry Lecture II  3
- 3450:335 Introduction to Ordinary Differential Equations  3
- 3650:292 Elementary Classical Physics II \(^1\)  4
- 4200:220 Introduction to Thermodynamic Processes  3
- 4300:201 Statics \(^1\)  3

#### Hours
- 16

### Summer Semester
- 4100:300 Cooperative Education Work Period (Possible)  0

### 3rd Year

#### Fall Semester
- 3250:244 Introduction to Economic Analysis  3
- 4200:310 Project Management and Teamwork III  1
- 4200:320 Phase Equilibrium Thermodynamics  3
- 4200:321 Process Economics  3
- 4200:341 Transport Phenomena  3
- 4200:353 Mass Transfer Operations  3
- Advanced Math Elective  2

#### Hours
- 17

#### Spring Semester
- 4100:301 Cooperative Education Work Period  0

### Summer Semester
- 3150:314 Physical Chemistry Lecture II  3
- General Education or Honors Distribution \(^4\)  3

#### Hours
- 6

### 4th Year

#### Fall Semester
- 4100:302 Cooperative Education Work Period  0

#### Spring Semester
- 4200:305 Materials Science  2
- 4200:330 Chemical Reaction Engineering  3
- 4200:351 Fluid & Thermal Operations  3

### 5th Year

#### Fall Semester
- 4200:410 Project Management and Teamwork IV  1
- 4200:435 Process Analysis & Control  3
- 4200:441 Process Design I  3
- General Education or Honors Distribution \(^4\)  3
- Advanced Chemistry Elective  3

#### Hours
- 13

#### Spring Semester
- 4200:442 Process Design II  3
- 4400:307 Basic Electrical Engineering  4
- 4200:xxx Chemical Engineering Elective \(^5\)  3
- 4200:xxx Chemical Engineering Design Elective \(^5\)  3
- General Education or Honors Distribution \(^4\)  3

#### General Electives  5

#### Hours
- 21

#### Total Hours
- 136

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1. Honors sections may be available; check the schedule of classes.
2. The Chemical and Biomolecular Engineering Department recommends that 3300:111 English Composition I be used to satisfy writing course requirement but other choices are available. See the General Education Program for details.
3. Check General Education Program or Honors Distribution to find courses that satisfy the second writing course requirement.
4. Credit hours shown for General Education or Honors Distribution are general guidelines only. These courses should be chosen in accordance with the appropriate General Education curriculum guide (for non-honors students) or Honors Distribution (for honors students). Honors students must also ensure that their course selections meet additional requirements not shown on this curriculum guide.
5. Honors students must take the Honors Project, which may count as a Chemical Engineering Elective or Chemical Engineering Design Elective. Consult your academic advisor.