Chemical Engineering, B.S.

Program Educational Objectives: Graduates of the Chemical Engineering program will (1) demonstrate achievement by applying a broad knowledge of chemical engineering; (2) apply critical reasoning and quantitative skills to identify and solve problems in chemical engineering; (3) implement skills for effective communication and teamwork; (4) demonstrate the potential to effectively lead chemical engineering projects in industry, government, or academia; and (5) exhibit a commitment to lifelong learning.

(Program educational objectives are those aspects of engineering that help shape the curriculum; achievement of these objectives is a shared responsibility between the student and UCI.)


Transfer Students: Preference will be given to junior-level applicants with the highest grades overall, and who have satisfactorily completed the following required courses: two years of approved calculus, one year of calculus-based physics with laboratories (mechanics, electricity and magnetism), completion of lower-division writing, one year of general chemistry (with laboratory), one year of organic chemistry (with laboratory), and one course in introductory programming. For course equivalency specific to each college, visit http://assist.org.

Students are encouraged to complete as many of the lower-division degree requirements as possible prior to transfer. Students who enroll at UCI in need of completing lower-division coursework may find that it will take longer than two years to complete their degrees. For further information, contact The Henry Samueli School of Engineering at 949-824-4334.

All students are required to meet the University Requirements (http://catalogue.uci.edu/informationforadmittedstudents/requirementsforabachelorsdegree/).

All students are required to meet the School Requirements (http://catalogue.uci.edu/thehenrysamuelischoolofengineering/#schoolrequirementstext).

Major Requirements

Mathematics and Basic Science Courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 1A</td>
<td>General Chemistry</td>
</tr>
<tr>
<td>or ENGR 1A</td>
<td>General Chemistry for Engineers</td>
</tr>
<tr>
<td>CHEM 1B-1C-1LC-1LD</td>
<td>General Chemistry and General Chemistry Laboratory and General Chemistry Laboratory</td>
</tr>
<tr>
<td>CHEM 51A-51B-51C-51LB-51LC</td>
<td>Organic Chemistry and Organic Chemistry Laboratory and Organic Chemistry Laboratory</td>
</tr>
<tr>
<td>CBE 105</td>
<td>Engineering Physical Chemistry</td>
</tr>
<tr>
<td>MATH 2A-2B</td>
<td>Single-Variable Calculus I and Single-Variable Calculus II</td>
</tr>
<tr>
<td>MATH 2D</td>
<td>Multivariable Calculus I</td>
</tr>
<tr>
<td>MATH 2E</td>
<td>Multivariable Calculus II</td>
</tr>
<tr>
<td>MATH 3A</td>
<td>Introduction to Linear Algebra</td>
</tr>
<tr>
<td>MATH 3D</td>
<td>Elementary Differential Equations</td>
</tr>
<tr>
<td>PHYSICS 7C-7LC</td>
<td>Classical Physics and Classical Physics Laboratory</td>
</tr>
<tr>
<td>PHYSICS 7D-7LD</td>
<td>Classical Physics and Classical Physics Laboratory</td>
</tr>
</tbody>
</table>

Engineering Topics Courses:

Students must complete a minimum of 18 units of engineering design.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBE 1</td>
<td>Introduction to Chemical Engineering</td>
</tr>
<tr>
<td>CBE 40A-40B-40C</td>
<td>Chemical Processes and Material Balances and Process Thermodynamics and Chemical Engineering Thermodynamics</td>
</tr>
<tr>
<td>CBE 100</td>
<td>Introduction to Numerical Methods in Engineering</td>
</tr>
<tr>
<td>CBE 110</td>
<td>Reaction Kinetics and Reactor Design</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td>CBE 120A-120B-120C</td>
<td>Momentum Transfer and Heat Transfer and Mass Transfer</td>
</tr>
<tr>
<td>CBE 130</td>
<td>Separation Processes</td>
</tr>
<tr>
<td>CBE 140A-140B</td>
<td>Chemical Engineering Laboratory I and Chemical Engineering Laboratory II</td>
</tr>
<tr>
<td>CBE 145</td>
<td>Chemical Process Control</td>
</tr>
<tr>
<td>CBE 150A-150B</td>
<td>Chemical Engineering Design I and Chemical Engineering Design II</td>
</tr>
<tr>
<td>CBE 160</td>
<td>Engineering Biology</td>
</tr>
<tr>
<td>ENGR 54</td>
<td>Principles of Materials Science and Engineering</td>
</tr>
<tr>
<td>ENGRMAE 10</td>
<td>Introduction to Engineering Computations</td>
</tr>
</tbody>
</table>

Students select, with the approval of a faculty advisor, any additional engineering topics courses needed to satisfy school and department requirements.

**Technical Elective Courses:**

Students select, with the approval of a faculty advisor, a minimum of 16 units of technical electives. Students may select an area of specialization and complete the associated requirements, as shown below.

(The nominal Chemical Engineering program will require 193 units of courses to satisfy all university and major requirements. Students typically need at least 14 units of engineering topics from technical electives to meet school requirements. Because each student comes to UCI with a different level of preparation, the actual number of units will vary.)

**Engineering Professional Topics Course:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 190W</td>
<td>Communications in the Professional World</td>
</tr>
</tbody>
</table>

**Specialization in Biomolecular Engineering:**

Requires a minimum of 11 units including at least one course from the following:

- CBE 161: Introduction to Biochemical Engineering
- CBE 163: Kinetics of Biochemical Networks

and a minimum of 8 units from the following:

- BIO SCI 98: Biochemistry
- BIO SCI 99: Molecular Biology
- BME 50A: Cell and Molecular Engineering
- BME 50B: Cell and Molecular Engineering
- BME 114: Genetic Engineering and Synthetic Biology
- BME 121: Quantitative Physiology: Organ Transport Systems
- BME 132: Introduction to Computational Biology
- BME 160: Tissue Engineering
- CBE 199: Individual Study (up to 4 units)

**Specialization in Energy and Sustainability:**

Requires a minimum of 11 units including at least one course from the following:

- CBE 172: Applied Spectroscopy
- CBE 175: Electrochemical Engineering
- CBE 176: Nuclear and Radiochemistry
- CBE 199: Individual Study (up to 4 units)
- MSE 141: Nano-Scale Materials and Applications

and select the remaining units from the following:

- ENGRCEE 160: Environmental Processes
- ENGRCEE 162: Introduction to Environmental Chemistry
- ENGRCEE 163: Wastewater Treatment Process Design
- ENGRCEE 164: Carbon and Energy Footprint Analysis
- ENGRCEE 165: Physical-Chemical Treatment Processes
- ENGRMAE 110: Combustion and Fuel Cell Systems
- ENGRMAE 114: Fuel Cell Fundamentals and Technology
- ENGRMAE 117: Solar and Renewable Energy Systems
ENGRMAE 164  Air Pollution and Control
MSE 158  Ceramic Materials for Sustainable Energy
MSE 171  Green Engineering: Theory and Practice

Specialization in Macromolecular Engineering:
Requires a minimum of 12 units from:

CBE 181  Polymer Science and Engineering
CBE 183  Surface and Adhesion Science
CBE 187  Semiconductor Device Packaging
CBE 199  Individual Study (up to 4 units)
MSE 69  Electronic and Optical Properties in Materials
MSE 141  Nano-Scale Materials and Applications
MSE 155  Mechanical Behavior and Design Principles
MSE 158  Ceramic Materials for Sustainable Energy
MSE 164  X-ray Diffraction, Electron Microscopy, and Microanalysis
MSE 174  Composite Materials Design
ENGRMAE 155  Composite Materials and Structures

The sample program of study chart shown is typical for the major in Chemical Engineering. Students should keep in mind that this program is based upon a sequence of prerequisites, beginning with adequate preparation in high school mathematics, physics, and chemistry. Students who are not adequately prepared, or who wish to make changes in the sequence for other reasons, must have their program approved by their faculty advisor. Chemical Engineering majors are encouraged to consult with academic counselors as needed, and students who are academically at risk are mandated to see a counselor as frequently as deemed necessary by the advising staff.

Freshman
Fall
MATH 2A
ENGRMAE 10
CHEM 1A or ENGR 1A
CBE 1
General Education
Winter
MATH 2B
PHYSICS 7C
PHYSICS 7LC
CHEM 1B
General Education
Spring
MATH 2D
PHYSICS 7D
PHYSICS 7LD
CHEM 1C
CHEM 1LC

Sophomore
Fall
MATH 3A
CHEM 51A
CHEM 1LD
CBE 40A
General Education
Winter
MATH 3D
CHEM 51B
CHEM 51LB
CHEM 40B
ENGR 54
Spring
MATH 2E
CHEM 51C
CHEM 51LC
CHEM 40C

Junior
Fall
CBE 100
CBE 120A
CBE 160
General Education
Winter
CBE 105
CBE 110
CBE 120B
General Education
Spring
CBE 120C
CBE 130
Technical Elective
General Education

Senior
Fall
CBE 140A
CBE 145
ENGR 190W
Technical Elective
Winter
CBE 140B
CBE 150A
Technical Elective
General Education
Spring
CBE 150B
Technical Elective
General Education

• Biomedical Engineering, B.S.
• Biomedical Engineering, M.S.
• Biomedical Engineering, Minor
• Biomedical Engineering, Ph.D.
• Biomedical Engineering: Premedical, B.S.